Fourth Five-Year Review Report

for the

Rasmussen's Dump Superfund Site

Brighton, Livingston County, Michigan

Prepared by:

U.S. Environmental Protection Agency

Region 5

Chicago, Illinois

Approved by:

Richard C. Karl, Director
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Date:

3/25/2015

Cover Photograph: The Rasmussen's Dump site groundwater treatment building viewed from the top of the landfill. (Photograph by Howard Caine)

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LIST OF ACRONYMS

AOC	Administrative Order on Consent
ARAR	Applicable or relevant and appropriate requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Contaminant of concern
ESD	Explanation of Significant Differences
EPA	United States Environmental Protection Agency
FYR	Five-Year Review
ICIAP	Institutional Control Implementation and Assurance Plan
ICs	Institutional controls
IW	Industrial waste
LCRC	Livingston County Road Commission
MCL	Maximum contaminant level (under the Safe Drinking Water Act)
MDEQ	Michigan Department of Environmental Quality
NCP	National Contingency Plan
NDBD	Northeast Buried Drum (site area)
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable unit
PCBs	Polychlorinated biphenyls
PDSLD	Probable Drum Storage, Leakage and Disposal (site area)
PRP	Potentially responsible party
RA	Remedial action
RAO	Remedial action objectives
RCRA	Resource Conservation and Recovery Act
RD	Remedial design
ROD	Record of Decision
RPM	Remedial project manager
RSRG	Rasmussen Site Remediation Group
TCE	Trichloroethene
TML	Top of the Municipal Landfill (site area)
µg/L	Micrograms per liter ("parts per billion")
UU/UE	Unlimited use/unlimited exposure
VC	Vinyl chloride
VOC	Volatile organic compound

EXECUTIVE SUMMARY

The U.S. Environmental Protection Agency (EPA), with assistance from the Michigan Department of Environmental Quality (MDEQ), has completed the fourth Five-Year Review (FYR) at the Rasmussen's Dump Superfund Site ("Site") in Livingston County, Michigan. The purpose of a FYR is to review information to determine if a selected remedy for a site is and will continue to be protective of human health and the environment. The triggering action for this statutory FYR at the Site was the completion of the third FYR report on March 30, 2010.

The 33-acre site is located south of Spicer Road about 40 miles west of Detroit and 5 miles south of Brighton, Michigan. The dump accepted domestic and drummed industrial wastes during the 1960s and early 1970s, but it was never properly capped and closed prior to termination of landfill operations in 1977. Sand and gravel mining, which began after the dump's closure, undermined the landfill and resulted in the redistribution of fill and drummed wastes. Initial investigations showed that on-site soil and groundwater were contaminated with volatile organic compounds (VOCs) and heavy metals.

EPA placed the Site on the National Priorities List (NPL) in September 1983. In 1985, EPA conducted a removal action to address drummed wastes. In March 1991, EPA issued a Record of Decision (ROD) that called for further removal of drummed wastes, installation and operation of a groundwater pump-and-treat system, conducting soil flushing, capping the landfilled areas, and implementing institutional controls (ICs) to restrict site access and re-use. In 1996, EPA completed remedy construction and MDEQ operated the groundwater pump and treat/soil flushing system until 2001. In 2001, EPA issued a ROD Amendment that changed the remedy regarding the treatment of residual soil and groundwater contamination; at that time operation of the groundwater pump-and-treat and soil flushing system was discontinued and an on-site ozone sparge system was implemented. The Rasmussen Site Remediation Group, representing the potentially responsible parties (PRPs) for the Site, now operate and maintain the ozone sparge system.

The remedial action for this site is protective of human health and the environment in the short-term because exposure to groundwater contamination has been halted. Long-term protectiveness will not be achieved, however, until the northern and southern groundwater contaminant plumes are fully characterized and delineated, and restrictive covenants are recorded for the Rasmussen's Dump site and a portion of the adjacent Spiegelberg property that was also subject to the Rasmussen site remedy. Long-term stewardship procedures will also be developed and implemented through development of an Institutional Controls Implementation Plan (ICIAP) or comparable document. Long-term stewardship involves assuring effective procedures are in place to properly maintain and monitor the Site. Long-term stewardship will ensure effective ICs are maintained, monitored, and enforced, and the remedy continues to function as intended with regard to ICs.

Because hazardous substances, pollutants, or contaminants remain in place at the Site above levels that allow for unlimited use and unrestricted exposure (UU/UE), EPA plans to conduct a fifth FYR at the Site no later than five years after the signature date of this report.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Rasmussen's Dump		
EPA ID: MID095402210		
Region: 5	**State:** MI	**City/County:** Brighton/Livingston County

SITE STATUS	
NPL Status: Final	
Multiple OUs? No	**Has the Site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: EPA
Author name (Federal or State Project Manager): Howard Caine
Author affiliation: U.S. EPA Region 5
Review period: 5/23/2014 – 3/19/2015
Date of Site inspection: 8/25/2014
Type of review: Statutory
Review number: 4
Triggering action date: 3/30/2010
Due date *(five years after triggering action date)*: 3/30/2015

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
None.

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): 01	**Issue Category:** Institutional Controls			
	Issue: Although deed restriction notices have been recorded on the deeds to the pertinent properties, enforceable restrictive covenants have not been recorded for this site.			
	Recommendation: The PRPs should finalize restrictive covenants for the property owners to sign and then record on the property deeds.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRPs	EPA/State	9/30/2015
OU(s): 01	**Issue Category:** Monitoring			
	Issue: The southern and northern groundwater contaminant plumes are not fully defined.			
	Recommendation: The PRPs should install and sample additional groundwater monitoring wells to fully define the plumes.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRPs	EPA/State	9/30/2015
OU(s): 01	**Issue Category:** Institutional Controls			
	Issue: Long-term stewardship of ICs has not been addressed.			
	Recommendation: The PRPs should develop an ICIAP or equivalent document that will include evaluation activities and the development of long-term stewardship procedures.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRPs	EPA/State	3/30/2016

OU1 & Sitewide Protectiveness Statement

Protectiveness Determination:
Short-term Protective

Protectiveness Statement:
The remedial action for this site is protective of human health and the environment in the short-term because exposure to groundwater contamination has been halted. Long-term protectiveness will not be achieved, however, until the northern and southern groundwater contaminant plumes are fully characterized and delineated, and restrictive covenants are recorded for the Rasmussen's Dump site and a portion of the adjacent Spiegelberg property that was also subject to the Rasmussen site remedy. Long-term stewardship procedures will also be developed and implemented through development of an ICIAP or comparable

document. Long-term stewardship involves assuring effective procedures are in place to properly maintain and monitor the Site. Long-term stewardship will ensure effective ICs are maintained, monitored, and enforced, and the remedy continues to function as intended with regard to ICs.

I. INTRODUCTION

The purpose of a FYR is to evaluate the implementation and performance of a remedy in order to determine if the remedy will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports. In addition, FYR reports identify issues, if any, found during the review and document recommendations to address them.

EPA conducts FYRs pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121 and the National Contingency Plan (NCP). CERCLA 121 states:

> *"If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews."*

EPA interpreted this requirement further in the NCP; 40 § C.F.R. Section 300.430(f)(4)(ii), which states:

> *"If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such actions no less often than every five years after the initiation of the selected remedial action."*

EPA, with assistance from MDEQ, has conducted this fourth FYR for the remedy implemented at the Rasmussen's Dump Superfund site in Brighton, Livingston County, Michigan. EPA is the lead agency responsible for developing and implementing the remedy for the Site. MDEQ, as the support agency representing the State of Michigan, has reviewed all supporting documentation and provided input to EPA during the FYR process.

The triggering action for this statutory review is the completion date of the previous FYR report (March 30, 2010). The FYR is required because hazardous substances, pollutants, or contaminants remain at the site above levels that allow for UU/UE. The site consists of one operable unit (OU).

EPA and MDEQ will place the completed FYR report in the Rasmussen's Dump site files and at the local site information repositories at the Brighton District Library in Brighton, Michigan and at the Hamburg City Library, 7225 Stone Street, Hamburg, Michigan.

II. PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

EPA issued the third FYR report for the site in March 2010 and determined that the remedy was protective of human health and the environment in the short term. Table 1 lists the protectiveness determinations/statements in the 2010 FYR report and Table 2 provides the status of the issues or recommendations.

Table 1: Protectiveness Determinations/Statements from the 2010 FYR

OU #	Protectiveness Determination	Protectiveness Statement
01 (and sitewide)	Short-term Protective	The remedial action for this site is protective in the short-term because exposure to groundwater contamination has been halted. Long-term protectiveness will not be achieved, however, until the northern and southern groundwater contaminant plumes are fully characterized and delineated, and restrictive covenants are recorded for the Rasmussen's Dump site and a portion of the adjacent Spiegelberg property (that was subject to the Rasmussen site remedy). The restrictive covenants, once implemented, must be monitored, maintained, and, if necessary, enforced by the PRPs to ensure future compliance with the restrictions.

Table 2: Status of Recommendations from the 2010 FY

OU	Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Party	Original Milestone Date	Current Status	Completion Date (if applicable)
01	Restrictive covenants that run with the land need to be finalized and put in place.	EPA to work with Michigan to finalize restrictive covenants that will be presented to the PRPs. The PRPs will work with the property owners to get them to agree to sign and record these restrictive covenants on their respective deeds.	PRPs	EPA/State	4/30/2011	Under discussion	Not completed
01	The southern and northern groundwater plumes are not completely defined.	PRPs to submit and implement a work plan to fully characterize and delineate the northern and southern groundwater plumes.	PRPs	EPA/State	9/30/2010	Addressed in the next FYR	Not completed

Recommendation 1

Since the completion of the 2010 FYR report, EPA has drafted restrictive covenants for the Site area properties and transmitted them to the PRPs for review and comment. EPA then provided revised restrictive covenants to MDEQ for its review and comment. Currently, EPA and MDEQ are discussing the terms of the restrictive covenants to ensure compliance with state law. Completion and recordation of the restrictive covenants is anticipated by September 2015.

Recommendation 2

Since the completion of the 2010 FYR, the Rasmussen Site Remediation Group (RSRG) has completed a work plan for installation of additional groundwater monitoring wells to completely define the northern and southern groundwater contaminant plumes. The PRPs have requested that Mr. Rasmussen (the Site property owner), the developer north of Spicer Road, and the Livingston County Road Commission (LCRC) provide access to install the additional monitoring wells on their respective properties or rights-of-way. Over the years, the three parties have repeatedly denied access to install the additional wells. On August 25, 2014, EPA, MDEQ, and the PRPs met with a representative of the LCRC to discuss the need to install groundwater monitoring wells in the county right-of-way and try to reach an understanding with the LCRC to allow installation of new monitoring wells. The RSRG re-applied for a permit to install groundwater monitoring wells in the right-of-way and the permit was approved by the LCRC on January 26, 2015. The RSRG stated Mr. Spiegelberg has recently given verbal approval to install an additional groundwater monitoring well on his property. Monitoring well installation is planned to begin this spring.

Remedy Implementation Activities

Institutional controls

Institutional controls are required by the 1991 ROD to ensure the protectiveness of the remedy. ICs are non-engineered instruments, such as administrative and/or legal controls, that help minimize the potential for exposure to contamination and protect the integrity of the remedy. Compliance with ICs is required to assure long-term protectiveness for any Site areas which do not allow for UU/UE. A map showing areas in which the ICs apply is included in Appendix B.

In the mid-1990s, several property owners signed deed restriction notices that were recorded on the deeds to their properties to satisfy the requirements of the 1991 ROD. It is recommended that these deed restriction notices be replaced by restrictive covenants that run with the land, as the deed restriction notices are not enforceable by a third party, unlike restrictive covenants. Table 3 (next page) provides a summary of the current and planned ICs.

For the Rasmussen property, the goals of the ICs included enforceable restrictions on future use so that people or animals are not exposed to contaminants and will not interfere with the remedial components. For the adjacent Spiegelberg property, there will also be an enforceable prohibition against mining, excavating, regrading, or otherwise disturbing the soil in several areas to protect the remedial components on the adjacent Rasmussen property and an enforceable prohibition against interference with any of the groundwater monitoring wells associated with

the site remedy.

Table 3: Summary of Planned and/or Implemented ICs

Media, engineered controls, and areas that do not support UU/UE based on current conditions	**ICs Needed**	**ICs Called for in the Decision Document**	**Impacted Parcel(s)**	**IC Objective**	**Title of IC Instrument Implemented and Date (or planned)**
Site Soil	Yes	Yes	The real estate also known as the Rasmussen site.	Prohibit human or animal exposure to contaminated soil in concentrations that present or may present a threat to health. Prohibit residential or commercial use that may interfere with the remedial action to be performed pursuant to the ROD. There shall be no activities at the Facility that may damage any remedial action component contracted or implemented pursuant to the ROD.	Deed Restriction Notice signed by Clara C. Rasmussen and Gloria F. Rasmussen dated January 15, 1992. Restrictive Covenant (planned).
Groundwater	Yes	Yes	The real estate also known as the Rasmussen site.	Prohibit human or animal exposure to contaminated groundwater in concentrations that present or may present a threat to health.	Deed Restriction Notice signed by Clara C. Rasmussen and Gloria F. Rasmussen dated January 15, 1992. Restrictive Covenant (planned)

Site Soil	Yes	Yes	The portion of the Spiegelberg property potentially impacted by the Rasmussen site remedy.	Prohibit mining, excavating, regrading, or disturbing the soils along the South Slope Area and the east/west Spiegelberg/Rasmussen property boundary of the Spiegelberg property. Prohibit any disturbance, disruption or interference with any other aspects of the remedy for the Rasmussen site.	Deed Restriction Notice signed by James H. Spiegelberg dated April 15, 1995. Restrictive Covenant (planned).
Groundwater	Yes	Yes	The portion of the Spiegelberg property potentially impacted by the Rasmussen site remedy.	Prohibit against interference with the current 14 or any additional monitoring wells on the Spiegelberg property needed to maintain or implement the groundwater remedy at the Rasmussen site	Deed Restriction Notice signed by James H. Spiegelberg dated April 15, 1995. Restrictive Covenant (planned)

Current Compliance

The ICs required by the 1991 ROD, as described above, appear to be functioning as intended. Based on Site inspections and interviews with stakeholders, EPA and MDEQ are not aware of any drinking water supply wells that have been installed within the impacted groundwater area. Residential supply wells near the Site have been tested over the last 21 years and have not detected any Site contaminants above Safe Drinking Water Act maximum contaminants levels (MCLs). In addition, based on site inspections and interviews with stakeholders, EPA and MDEQ are not aware of any disturbance to the integrity of the landfill cap.

EPA continues to work with MDEQ and the RSRG to draft enforceable restrictive covenants for the Site that can be recorded on the Rasmussen and Spiegelberg property deeds to provide even stronger protection beyond the existing deed restriction notices. Once EPA and MDEQ complete the restrictive covenants, the RSRG will work with the property owners to have the restrictive covenants recorded so that the cap is protected.

Institutional Controls Follow up Actions Needed

The RSRG will develop an ICIAP or equivalent document that will include IC evaluation activities and the development of long-term stewardship procedures. The IC evaluation activities will include, as needed, updated maps depicting current conditions in areas that do not allow for UU/UE, and conducting title work to ensure no prior encumbrances exist on the Site that are inconsistent with the ICs.

Long-Term Stewardship

Since compliance with ICs is necessary to assure the protectiveness of the remedy, planning for long-term stewardship is required to ensure that the ICs are maintained, monitored and enforced so that the remedy continues to function as intended. Long-term stewardship involves assuring effective procedures are in place to properly maintain and monitor the Site. The ICIAP will include procedures to ensure long-term stewardship such as regular inspection of the engineering controls and access controls at the Site and review of the ICs at the Site. The ICIAP should also include a requirement for an annual certification by the RSRG to EPA that ICs are in place and effective. Finally, development of a communications plan and use of the State's one call system should be explored.

System Operation/Operation and Maintenance (O&M) Activities

Currently, the RSRG is conducting O&M activities at the Site, which include maintaining the landfill cap, operating and maintaining the groundwater ozone/oxygen oxidation system, and maintaining Site security. The sparge wells in the northern zone are operated on an alternating, one week on and one week off schedule. Table 4 provides a brief description of O&M activities.

Table 4: Operation and Maintenance Activities

Date of Issue	Description of Issue	Date Resolved	Description of Resolution
Sept 2009	Solenoid valve malfunction	October 2009	Solenoid Valve Replaced
March 2010	Compressor Oil Leak	March 2010	Replaced fitting which stopped leak
March 2010	Ozone sparge line leak	March 2010	Repaired line
June 2010	Ozone sparge lines leak	June 2010	Repaired lines
June 2010	Storm knocked out power	June 2010	Power restored
Sept 2010	Compressor Oil Leak	Sept 2010	Replaced oil hoses and solenoid valves
Oct 2010	Ozone distribution panel and ozone generator malfunctioned	Nov 2010	Ozone generator replaced with new model; old ozone generator repaired and placed on stand-by, if needed
March, May, and July 2011	Ozone sparge lines leaking	April, May, and July 2011	Lines repaired
June 2011	Well 81-8 became fouled	June 2011	Well re-developed
July 2011	Solenoid valve malfunction	July 2011	Solenoid valves rebuilt
Aug 2011	Alarm call	Aug 2011	Power restored
Sept 2011	Ozone sparge lines blocked	Sept 2011	Blockages removed
Oct 2011	Ozone sparge lines leak	Oct 2011	Lines repaired
Nov 2011	Ozone sparge lines leak	Nov 2011	Lines repaired
March 2012	Alarm call	March 2012	Ozone generator needed new pressure switch
Continuous issue	Ozone sparge line leaks	June 2012	HDPE lines replaced with Teflon
Aug 2012	Solenoid valve malfunction	Aug 2012	Solenoid valve rebuilt
Sept 2012	Ozone generator leak	Sept 2012	Tubing repaired
April 2014	Compressor failed	April 2014	Motor starter replaced
May 2014	Compressor belt shredded	May 2014	Belt replaced

III. FIVE-YEAR REVIEW PROCESS

Administrative Components

EPA notified MDEQ and representatives of the PRPs of the initiation of the Rasmussen site FYR by letter (Attachment C) dated May 23, 2014. The review team included EPA Remedial Project Manager (RPM) Howard Caine and Keith Krawczyk, MDEQ. J.R. "Bart" Bartholomy of RSRG contractor Conestoga-Rovers Associates (CRA) provided assistance.

From May 2014 to March 2015, the review team reviewed historical data and documents, visited and inspected the Site, and prepared the FYR report. Howard Caine, EPA, and Keith Krawczyk, MDEQ, completed the FYR site inspection on August 25, 2014 (Attachment D). Bart Bartholomy and Steve Rapai, CRA, and Steve Nadeau, RSRG, also participated in the inspection. Prior to the site inspection, Messrs Caine, Krawczyk, Bartholomy, and Rapai met with Kim Hiller of the LCRC to discuss the proposed installation of groundwater monitoring

wells in the county's right-of-way.

Community Notification

EPA notified the community that it was beginning the FYR for the site via a display advertisement in the *Livingston County Press & Argus* on July 27, 2014 (Attachment E).

Document Review

The RPM reviewed Site documents for this FYR including the 1991 ROD, 1991 ESD, 2001 ROD Amendment, quarterly monitoring reports submitted by the PRPs, the 2010 FYR report, and other information and correspondence concerning the site.

Data Review

In April 2007, EPA and MDEQ requested that the RSRG provide an annual assessment of the groundwater monitoring trends at the Site. The RSRG provided contour maps of chemicals of concern (COCs) distribution and complete trend analyses of the COCs on an annual basis, after completing groundwater sampling and analysis in accordance with the Site groundwater remediation monitoring program. EPA has summarized current groundwater monitoring data in Attachment F. Groundwater contaminant plume maps are also included in Attachment F. It can be seen in comparing the plume locations from 2010 to 2014 that the areal extent of vinyl chloride (VC) has decreased and the extent of trichloroethene (TCE) has remained stable.

The groundwater contaminant plumes are not underneath any homes in the area, thus vapor intrusion is not an issue at this Site.

2010

There were some changes in the distribution of COCs in 2010 as compared to 2009. The eastern extent of the northern VC plume increased slightly. VC levels in groundwater samples collected from well number CRA-RA-24, which defines the southeastern limit of the northern VC plume, increased from 1 microgram per liter (µg/L) in September 2009 to 2.9 µg/L in August 2010. VC in groundwater samples collected from well CRA-RA-30 decreased slightly from 2.4 µg/L in September 2009 to 2.1 µg/L in August 2010.

VC was present in the groundwater sample collected from well CRA-RA-6S in August 2009 at a concentration of 3.9 µg/L. The extent of the southern VC plume decreased in 2010 because VC was detected at a concentration of 1.9 µg/L in groundwater samples collected from well CRA-RA-6S in September 2010. The September 2010 result is less than the Michigan Part 201 drinking water criterion (DWC) of 2 µg/L for VC. VC levels in groundwater samples collected from monitoring well 81-4, which defines the northern extent of the central VC plume, decreased slightly from 4.6 µg/L in August 3.7 µg/L in September 2010. VC concentrations in groundwater samples collected from well CRA-RA-27 decreased from 20 µg/L in August 2009 to a concentration of 12 µg/L in September 2010.

Slightly elevated levels of VC were detected (4.3 µg/L) in well CRA-RA-2D in August 2009. The concentration of VC decreased to 1.6 µg/L in the groundwater sample collected from well CRA-RA-2D in the sample taken in September 2010. Groundwater samples collected from nearby well EB-PZ-4 in August 2009 contained VC at a concentration of 3.6 µg/L. VC was not detected (method detection limit = 1.0 µg/L) in the groundwater sample collected from well EB-PZ-4 in August 2010. Both these 2010 results were less than the Michigan Part 201 DWC of 2 µg/L for VC and as a result this VC plume was eliminated from the monitoring program.

Most of the extent of the southern TCE plume is based on pre-2009 data and is therefore unchanged. However, TCE concentrations in groundwater samples collected from well CRA-RA-26S increased from 110 µg/L in August 2009 to 130 µg/L in September 2010. This still reflects an overall decrease compared to the peak concentration of 660 µg/L and 670 µg/L (duplicate sample) collected from well CRA-RA-26S in 2002.

2011

There were some changes in the distribution of COCs in 2011 as compared to 2010. VC in groundwater samples collected from monitoring wells within the limits of the northern VC plume increased slightly. VC was not detected (method detection limit = 1 µg/L) in groundwater samples collected from wells CRA-RA-29 and CRA-RA-32 in August 2010 and again in August 2011. These results define the northern limit of the northern VC plume.

VC was present in the groundwater sample collected from well CRA-RA-6S in August 2010 at a concentration of 1.9 µg/L. The concentration of COCs in the southern VC plume decreased slightly in 2011 with VC detected at 1.5 µg/L/1.5 µg/L (duplicate) groundwater samples collected from well CRA-RA-6S in August 2011.

Most of the extent of the southern TCE plume is based on pre-2010 data and is therefore unchanged. However, TCE concentrations in groundwater samples collected from well CRA-RA-26S increased from 130 µg/l in August 2010 to 155 µg/l in August 2011. This still reflects an overall decrease compared to the peak concentration of 660 µg/L / 670 µg/L in a duplicate sample collected from well CRA-RA-26S in 2002.

There was an increase in TCE concentrations in the groundwater samples collected from southern monitoring well CRA-RA-23D, from 3.9 µg/L in August 2010 to 5.3 µg/L in August 2011. These August 2011 results were greater than the Michigan Part 201 DWC of 5 µg/L for TCE.

The PRPs attributed COC increases observed in late 2011 to be a result of breaks in the ozone supply lines in 2010 and 2011. Repairs were made to the lines and then they began to routinely monitor air pressure in the lines to ensure ozone was being delivered to the sparge wells.

2012

There were some changes in the distribution of COCs in 2012 as compared to 2011. Groundwater samples collected from well EB-PZ-4 in August 2009 contained VC at a

concentration of 3.6 µg/L. VC was not detected in samples collected from well EB-PZ-4 in September 2010 and August 2011. However, a slightly elevated concentration of VC was detected (3.3 µg/L) in September 2012. Since the 2012 results were greater than the Part 201 DWC levels of 2 µg/L, the 2012 report showed a plume in the vicinity of well EB-PZ-4.

Most of the extent of the southern TCE plume is based on pre-2009 data and is therefore unchanged. However, TCE concentrations in groundwater samples collected from well CRA-RA-26S decreased from 155 µg/L in August 2011 to 100 µg/L in September 2012. This reflects an overall decrease compared to the peak concentration of 660 µg/L / 670 µg/L (duplicate) collected from well CRA-RA-26S in 2002.

2013

There were very minor changes in the concentration of COCs in 2013 as compared to 2012. Tables 5 and 6 display selected results.

Table 5: Selected VC Results for 2012 and 2013

Monitoring Well	**Q3 2012 Result** (µg/L)	**Q3 2013 Result** (µg/L)	**Trend**
CRA-RA-22	7.4	7.3	No change
CRA-RA-24	3.5	5	Slight increase
CRA-RA-27	13	12	Slight decrease
CRA-RA-28	1.0	1.1	No change
CRA-RA-30	3.5	3.3	No change
EB-PZ-4	3.3	2.2	Slight decrease
81-4	3.1	2.5	Slight decrease

Table 6: Selected TCE Results for 2012 and 2013

Monitoring Well	**Q3 2012 Result** (µg/L)	**Q3 2013 Result** (µg/L)	**Trend**
CRA-RA-23D	4.9	5.9	Slight increase
CRA-RA-26S	100	95	Slight decrease

As seen in Table 5 and 6, the COC levels are relatively stable and the 2013 concentration contours are very similar to the 2012 COC concentration contours.

Trend Analysis

The PRPs completed a trend analysis for benzene, TCE, and VC data from monitoring wells included in the groundwater remediation monitoring program and the annual landfill monitoring program. Two separate trend analyses were completed: one for all the data available from each well and another for only the last eight results. The trend analysis of all data provides an overall assessment of changes in COC concentrations since groundwater monitoring began. Analysis of trends in data sets restricted to the last eight monitoring events provides insight into recent changes in COC concentrations. Table 7 lists the principal trends identified as of the third quarter 2010 groundwater sampling event.

Table 7: Trends in COCs - 2010

Trend Analysis 2010		
Monitoring Well	**All Data**	**Last 8 Results**
81-4	Increasing VC	No Trend Identified
CRA-RA-2D	Decreasing Benzene	No Trend Identified
CRA-RA-18	No Trend Identified	No Trend Identified
CRA-RA-22	Increasing VC	No Trend Identified
CRA-RA-23D	Decreasing TCE	No Trend Identified
CRA-RA-24	No Trend Identified	Increasing VC
CRA-RA-25	Decreasing Benzene	No Trend Identified
CRA-RA-26S	Decreasing TCE	No Trend Identified
CRA-RA-27	Decreasing VC	No Trend Identified
CRA-RA-28	Decreasing VC	No Trend Identified
CRA-RA-30	Increasing VC	No Trend Identified
PZ-104	Decreasing VC	No Trend Identified

The decreasing trends identified in the analysis of all data represent ongoing remediation of groundwater beneath the site. The PRPs identified fewer trends in the analysis of the last eight monitoring rounds, which reflects relatively stable conditions.

The PRPs identified an increasing trend in the VC data from well 81-4 for the first time in 2010. Prior to 2004, well 81-4 was not included in routine groundwater sampling at the site. When sampling commenced in 2004, VC was present at a concentration of around 2 µg/L. Since September 2008, VC concentrations in groundwater samples collected from well 81-4 have ranged from 3 µg/L to 4.6 µg/L. There is no increasing trend in the trend analysis based on the last eight results, so the increasing trend is a result of the overall increase in VC concentrations since 2004, and not a recent expansion of the plume.

The initial concentration of VC in groundwater samples collected from well CRA-RA-24 was 25 µg/L in 1999. Subsequently, VC concentrations decreased and by 2002, VC concentrations were typically 1 µg/L or were less than the method detection limit (1 µg/L). Since August 2009, VC concentrations have ranged from 2.4 µg/L to 3.1 µg/L. The PRPs attributed the post-September 2009 increase in VC concentrations in groundwater samples collected from well CRA-RA- 24 to a combination of broken ozone supply lines and equipment failures in the treatment system that occurred between April 2009 and September 2009.

A trend analysis was not completed in 2011.

Table 8 lists the principal trends as of 2012 groundwater sampling events.

Table 8: Trends in COCs - 2012

Trend Analysis 2012		
Monitoring Well	**All Data**	**Last 8 Results**
81-4	Increasing VC	No Trend Identified
CRA-RA-2D	Decreasing Benzene	Decreasing Benzene
CRA-RA-18	Decreasing VC	No Trend Identified
CRA-RA-22	Increasing VC	No Trend Identified
CRA-RA-23D	Decreasing TCE	No Trend Identified
CRA-RA-24	Increasing VC	No Trend Identified
CRA-RA-25	Decreasing Benzene	No Trend Identified
CRA-RA-26S	Decreasing TCE	Increasing TCE
CRA-RA-27	Decreasing VC	No Trend Identified
CRA-RA-28	Decreasing VC	No Trend Identified
CRA-RA-30	Increasing VC	No Trend Identified
PZ-104	Decreasing VC	No Trend Identified

Three increasing and seven decreasing trends were seen. The decreasing trends identified in the analysis of all data represent ongoing remediation of groundwater beneath the Site. Increasing trends represent contaminant migration during the groundwater remedy. With one increasing and one decreasing trend seen over the last eight monitoring rounds, relatively stable plume conditions are reflected over these past two years.

The PRPs identified a slightly increasing trend in the VC data from well 81-4 for the first time in 2012. Prior to 2004, well 81-4 was not included in routine groundwater sampling at the site. When sampling commenced in 2004, VC was present at a concentration of around 2 µg/L. Since September 2008, vinyl chloride concentrations have ranged from 2.9 µg/L to 4.6 µg/L. There is no increasing trend in the trend analysis based on the last eight results. Therefore, the increasing trend is a result of the overall increase in VC concentration since 2004, and not a recent expansion of the plume.

VC was not detected in the initial groundwater samples collected from well CRA-RA-30 in 2003. Subsequently, VC concentrations increased and by May 2012, the VC concentration was 5.9 µg/L. The PRPs identified an increasing trend regarding the concentration of VC in groundwater samples collected from well CRA-RA-30 since 2003. From December 2010 through September 2012 (eight monitoring rounds), the concentration of VC has ranged from 3.0 µg/L to 5.9 µg/L and no trend was identified in these data. The PRPs repaired broken ozone supply lines in the vicinity of well CRA-RA-30 in spring 2012. VC concentrations decreased from 5.9 µg/L in May 2012 to 3.5 µg/L in September 2012.

VC was not detected in the initial groundwater samples collected from well CRA-RA-22 in 1996 through 2001. Subsequently, VC was detected in November 2001 at a concentration of 7 µg/L, an increasing trend. From December 2010 through September 2012, VC concentration has ranged from 3.8 µg/L to 8.2 µg/L. There was no trend identified in these recent well CRA-RA-22 VC data.

Table 9 lists trends in COCs in 2013.

Table 9: Trends in COCs - 2013

Trend Analysis 2013		
Monitoring Well	**All Data**	**Last 8 Results**
81-4	Increasing VC	No Trend Identified
CRA-RA-2D	Decreasing Benzene	No Trend Identified
CRA-RA-18	Decreasing VC	No Trend Identified
CRA-RA-22	Increasing VC	No Trend Identified
CRA-RA-23D	Decreasing TCE	No Trend Identified
CRA-RA-24	Increasing VC	No Trend Identified
CRA-RA-25	Decreasing Benzene	No Trend Identified
CRA-RA-26S	Decreasing TCE	No Trend Identified
CRA-RA-27	Decreasing VC	No Trend Identified
CRA-RA-28	Decreasing VC	No Trend Identified
CRA-RA-30	Increasing VC	No Trend Identified
PZ-104	Decreasing VC	No Trend Identified

The PRPs did not report any increasing or decreasing trends in the analysis of the past eight monitoring rounds, which reflects relatively stable plume conditions over the last two years.

Lower Aquifer and Rasmussen Residential Groundwater Data

Groundwater samples were collected from lower aquifer monitoring well RA-MW-47 and the Rasmussen residential well. No COCs were detected in the groundwater samples collected from these wells during this FYR period. It should be noted that there was a leak in the Rasmussen residential well at the end of 2012 and much of 2013. After the leak was repaired, a sample was collected and no COCs were detected. The Rasmussen residential well was again out of service, pending a repair, during 2014.

Lead

Lead was detected in samples from three monitoring wells during the second quarter 2011 routine groundwater sampling event. Table 10 lists the impacted wells and the measured results.

Table 10: Lead results (2011)

Monitoring Well	**Results**
CRA-RA-6S	64.3 µg/L total lead, 3.0 µg/L dissolved lead
CRA-RA-18	5.1/4.9 µg/L dissolved lead (duplicate sample)
CRA-RA-19S	3.0 µg/L total lead, 4.9 µg/L dissolved lead

Three of the five lead concentrations reported above were greater than the Michigan Part 201 DWC of 4 µg/L for lead. Because lead is not typically detected in Site water samples, the PRPs collected confirmatory samples in the third quarter 2011 sampling round. Lead was not detected. Thus, the second quarter 2011 lead detections may have been a laboratory artifact and not true detections of lead in the groundwater.

Additional Work

Installation of New Groundwater Monitoring Wells

EPA and MDEQ met with the PRPs on July 11, 2011 to discuss the installation of additional groundwater monitoring wells at the Site in order to fully delineate the northern and southern plumes. In 2012, it was agreed that the PRPs would install one new well on the Spiegelberg property to delineate the southern plume and three new wells along Spicer Road to delineate the northern plume. The PRPs agreed to contact the property owners to gain access to install the new wells. EPA and MDEQ approved the new groundwater monitoring locations in 2013.

In 2013, the PRPs began contacting property owners in an attempt to gain access to install the new wells. The PRPs contacted the property owner north of Spicer Road to request access but were denied. Mr. Rasmussen was contacted for access to install the new monitoring wells on his property, but he also denied access. The PRPs then contacted the LCRC and submitted an application for a permit to install new wells in the county right-of-way, but were again denied access.

In 2014, EPA contacted the LCRC on behalf of the PRPs to request access. Prior to the FYR site inspection on August 25, 2014, a representative of the LCRC met with EPA, MDEQ and the PRPs to discuss the need for new monitoring wells and the LCRC informed the Site representatives of its requirements for access. The LCRC indicated that it, at a minimum, would allow access to collect groundwater samples through vertical aquifer sampling and indicated that the PRPs should reapply for access to install the new wells. The PRPs re-applied for a permit to install groundwater monitoring wells in the right-of-way on January 22, 2015. The permit was approved by the LCRC on January 26, 2015.

EPA/MDEQ Technical Concerns

Because MDEQ raised a concern about the accuracy of the 1999 survey of the Site monitoring wells, EPA requested that the PRPs resurvey the groundwater monitoring well locations. The agencies' primary concern was localized groundwater direction flows, since the data show, particularly in the northern plume that groundwater flow is in all directions. Similar uncertainties exist in the southern plume, but to a lesser degree. The PRPs resurveyed the monitoring wells on March 28 and 29, 2012. The survey confirmed that the localized groundwater flow directions persist and that they are not the result of survey errors.

EPA also recommended that the PRPs improve the figures and maps in their groundwater reports, and suggested that the PRPs prepare "layered" aerial maps, which would provide for more accurate plotting of data. The PRPs agreed to provide the improved figures and maps for the future quarterly reports.

Because there was a concern that ozone sparging may be causing the groundwater to "mound" in the vicinity of the ozone sparge wells, EPA requested that the PRPs gather groundwater elevation data with the ozone sparge system running and then with the system off. In late March 2012, the PRPs measured groundwater elevations and then turned off the ozone sparging system.

A week later, in April 2012, the PRPs measured groundwater levels again and then restarted the ozone sparging system. The difference in groundwater elevations between the two monitoring events ranged from -0.06 feet to +0.42 feet, but most of the groundwater elevation changes were in a narrower range of values, 0.15 feet to 0.23 feet. The localized groundwater flow patterns discussed above were unchanged between the two monitoring events. The data demonstrates that the ozone system is not causing groundwater mounding around the sparge wells.

Private Drinking Water Monitoring

The State of Michigan funded and conducted a residential well monitoring program in the Site area, in part due to the presence of the Site groundwater contaminant plume. The residential well monitoring program has been under way for approximately 16 years, involving 12 homes in close proximity of the Site. Based on a review of the data collected, no contamination was found exceeding MCLs in any of the residential wells sampled over this period of time, and, as a result, monitoring was then reduced to four homes adjacent to the site. Michigan continues to sample the four homes in the immediate vicinity of the site due to the potential for migration of the groundwater contaminant plumes. No contaminants have been found in these four homes' wells.

Site Inspection

Howard Caine, EPA RPM, and Keith Krawczyk, MDEQ Project Manager, conducted the FYR site inspection on August 25, 2014 (Attachment D). Bart Bartholomy and Steve Rapai, CRA, and Steve Nadeau (RSRG) participated in the site inspection.

The site team viewed the building housing the ozone system, inspected the cap, inspected the monitoring wells, and walked around the landfill. The cap was in good condition. All observed groundwater monitoring wells were locked and appeared to be in good condition. Signs prohibiting trespassing and advising of security patrols were present. The fence was intact and in good condition and the gates were equipped with working locks.

IV. TECHNICAL ASSESSMENT

Question A: Is the remedy functioning as intended by the decision documents?

Yes. A review of the relevant documents and the results of the Site inspection indicate that the remedy is functioning as intended by the 1991 ROD, as amended by the ESD and ROD Amendment (see Site history in Appendix A). The remedy has progressed and many of the original components described in the 1991 ROD have been completed or discontinued and replaced with alternative remedial measures as set forth in the subsequent decision documents. The major completed remedial action components include: source area excavation (drum removal and soil removal), construction and completion of a cap over the landfill area on-Site, and on-Site groundwater pump-and-treat with discharge of treated groundwater through a seepage basin to flush area soil. The latter groundwater remedy was discontinued and replaced with an ozone sparging system. Residential well sampling continues to ensure that area drinking water is not negatively impacted.

The ICs, as required by the 1991 ROD, are in place. No activities were observed that violate the existing ICs, although the agencies will seek to replace the deed restriction notices with restrictive covenants for enforceability and enhancement of long-term protectiveness. The cap and the surrounding area are undisturbed, and no new uses of groundwater were observed at the Site.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy section still valid?

Yes. There have been no changes in the physical conditions of the Site that would affect the exposure assumptions used at the time of remedy selection. There has not been any change in the use of the property over the past five years. There have been no changes in land use near the Site, nor are changes expected in the near future. There is a proposed housing development north of the Site, but construction has not commenced, and there are no exposures from Site conditions that would pose an unacceptable threat to the housing development if it was built. It is anticipated that this new housing development will use municipal water. There have been no newly observed species or ecologic settings at the site.

There have been no changes in the applicable or relevant and appropriate requirements (ARARs) and to-be-considered cleanup levels that affect the protectiveness of the remedy. There have been no changes in the human and ecological exposure assumptions or the toxicity data that were used in the risk assessment at the time of the remedy selection that would affect the protectiveness of the remedy. There has been no change in the standardized risk assessment methodology that would affect the protectiveness of the remedy. The RAOs used at the time of remedy selection are still valid.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No. There is no other information that calls into question the protectiveness of the remedy.

Technical Assessment Summary

The remedy is functioning as intended by the 1991 ROD, as amended by the ESD and ROD Amendment and is protective of public health and the environment. The existing deed restrictions will be replaced with restrictive covenants for enforceability and enhancement of long term protectiveness. In addition, because the southern and northern groundwater plumes are not completely defined, additional monitoring wells will be installed and a groundwater investigation done.

There have been no changes in the physical conditions of the Site or changes in property use that would affect the protectiveness of the remedy. There have been no changes in the exposure assumptions or toxicity factors for the contaminants of concern that were used in the baseline risk assessment at the time of remedy selection; and there have been no changes to the standardized risk assessment methodology that could affect the protectiveness of the remedy. There is no information that calls into question the protectiveness of the remedy.

V. ISSUES/RECOMMENDATIONS AND FOLLOW-UP ACTIONS

Table 11 lists the issues, recommendations and follow-up actions for the site.

Table 11: Issues and Recommendations/Follow-up Actions

OU #	Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
						Current	Future
01	Restrictive covenants that run with the land need to be finalized and recorded.	EPA and MDEQ shall work with the PRPs to finalize the restrictive covenants. The PRPs shall then work with the property owners to get the restrictive covenants recorded on the deeds to their properties.	PRPs	EPA/State	9/30/2015	No	Yes
01	The southern and northern groundwater plumes are not completely defined.	PRPs shall obtain access from property owners to install groundwater monitoring wells so the contaminant plumes can be defined.	PRPs	EPA/State	9/30/2015	No	Yes
01	Long-term stewardship of ICs has not been addressed.	PRPs shall develop an ICIAP or equivalent document that will include IC evaluation activities and the development of long-term stewardship procedures.	PRPs	EPA/State	3/30/2016	No	Yes

VI. PROTECTIVENESS STATEMENTS

OU1 & Sitewide Protectiveness Statement
Protectiveness Determination: Short-term Protective
Protectiveness Statement: The remedial action for this site is protective of human health and the environment in the short-term because exposure to groundwater contamination has been halted. Long-term protectiveness will not be achieved, however, until the northern and southern groundwater contaminant plumes are fully characterized and delineated, and restrictive covenants are recorded for the Rasmussen's Dump site and a portion of the adjacent Spiegelberg property that was also subject to the Rasmussen site remedy. Long-term stewardship procedures will also be developed and implemented through development of an ICIAP or comparable document. Long-term stewardship involves assuring effective procedures are in place to properly maintain and monitor the Site. Long-term stewardship will ensure effective ICs are maintained, monitored, and enforced, and the remedy continues to function as intended with regard to ICs.

VII. NEXT REVIEW

The next FYR will be due five years from the signature date of this report.

Appendix A – Existing Site Information

A. SITE CHRONOLOGY

Table A1: Site Chronology

Event	Date
Waste dumping occurred	1960s-1977
Preliminary site investigations; PRPs sent information about the investigations	1983-1991
Site proposed for NPL	December 30, 1982
Site became final on the NPL	September 8, 1983
Action Memo for removal action signed	October 30, 1984
Removal action completed	January 11, 1985
Remedial Investigation/Feasibility Study (RI/FS) completed	March 28, 1991
ROD signed	March 28, 1991
Explanation of Significant Differences (ESD) signed	July 1991
Remedial Design completed	March 16, 1995
Preliminary Close Out Report (PCOR)	September 25, 1995
Remedial Action completed	November 27, 1996
First FYR report signed	August 28, 2000
ROD Amendment signed	July 20, 2001
Second FYR report signed	August 25, 2005
Third FYR report signed	March 30, 2010

B. BACKGROUND

Physical Characteristics

The 33-acre Rasmussen property is situated south of an unpaved secondary road (Spicer Road), about 40 miles west of Detroit and 5 miles south of Brighton, in Green Oak Township, Livingston County, Michigan. Woods, open fields, and rural residences surround the property.

Land and Resource Use

The Rasmussen family occupies two residences on the Site. An auto body shop/auto salvage yard is located on the northern portion of the Site property. The southern portion of the property was

previously operated as a municipal/industrial landfill and as a gravel/sand borrow pit. Rasmussen's Dump is bounded by separate property on the east that is reportedly owned by a relative of the Rasmussen family and by the Spiegelberg property (which includes the ½ acre Spiegelberg Landfill Superfund site) to the west and south. The Spiegelberg property also has an active gravel mining operation. Land in the vicinity of site consists of a mixture of commercial and residential properties, but is mostly residential.

History of Contamination

Rasmussen's Dump accepted domestic and industrial wastes during the 1960s and early 1970s, which were placed on-site and formed a ridge-like crest across the southern portion of the Site. Drummed and other industrial wastes were also disposed of at other locations on site. Numerous incidents of burning were reported during the dump's operation. Several attempts were made by the county and state to bring Rasmussen's Dump into compliance with state laws, but the dump was never properly capped and closed prior to termination of landfill operations in 1977. Sand and gravel mining, which began after closure of the dump in 1977, undermined the landfill and resulted in the redistribution of fill and drummed wastes.

Initial Response

Low levels of groundwater contamination were detected in a 1981 study conducted by the Michigan Department of Natural Resources (MDNR) (now MDEQ). EPA's Field Investigation Team conducted an inspection of the Site in 1982, and the Site was scored and placed on the NPL in 1983.

EPA and MDNR commenced a RI/FS at the Site in 1984.

Basis for Taking Action

Major chemicals contributing to the carcinogenic risks from dermal contact with Site soils were as follows: PCBs and benzo(a)pyrene for the Top of the Municipal Landfill (TML) area; PCBs for the Industrial Waste (IW) area; PCBs for the Probable Drum Storage, Leakage and Disposal (PDSLD) area; and dioxins for the Northeast Buried Drum (NEBD) area. The drummed wastes and associated contaminated soils were removed from the IW, NEBD and TML areas of concern during removal actions at the Site. Further remediation of these soils areas, however, was also required to mitigate the potential risk posed by the contaminated soils to groundwater. At the completion of the remedial investigation, data indicated that contamination existed in isolated lenses in the PDSLD unsaturated zone. The 1989/1990 supplemental soils investigation showed the presence of contaminated soils in the PDSLD area, which is a current source of groundwater contamination. The 20 COCs identified in the Site groundwater plume are identified in Table A2 (on the next page).

Although no individuals at the time of the RI/FS were ingesting contaminated groundwater from the Site, the contamination posed a health risk to potential future receptors. In order to protect public health and the environment, remediation of the groundwater resource was necessary. The soils in the NEBD, TML and IW areas posed potential future contaminant risks to the

groundwater resource, while the PDSLD area posed a current risk to the groundwater resource. Current and future risks from direct dermal contact or from inhalation of airborne contaminants, when modeled, were not significant. An assessment also found that there were no unacceptable ecological risks posed by the site.

Table A2

Groundwater Chemicals of Concern		
Acetone	Benzene	bis(2-ethylhexyl)phthalate
2-butanone	Cadmium	chlorobenzene
2-chlorophenol	1,1-dichloroethene	1,2-dichlorothene
Ethylbenzene	isophorone	Lead
2-methylphenol	4-methyl-2-pentanone	methylene chloride
Toluene	1,1,1-trichloroethane	trichloroethene
vinyl chloride	Xylenes	

C. REMEDIAL ACTIONS

Remedy Selection

In March 1991, EPA issued a ROD that selected a cleanup approach for the Site. The State of Michigan concurred with the selected remedial action.

The RAOs for the Site are:

(1) reduce the potential for human exposure to hazardous substances in the contaminated groundwater resources,
(2) reduce the potential for human exposure to hazardous substances from contact with the contaminated soils areas, and
(3) reduce the potential for remaining hazardous substances to contaminate other resources.

The selected remedial action for the Site as documented in the 1991 ROD included:

(1) Cap waste in the TML and NEBD areas;
(2) Remove waste drums containing hazardous wastes or pollutants unearthed during cap construction and dispose of the drums in an approved off-site facility;
(3) Pump-and-treat contaminated groundwater using chemical precipitation, followed by pH adjustment to remove metal contaminants, and air stripping and granular-activated carbon to remove residual organic contaminants as necessary;
(4) Discharge treated groundwater on Site via a seepage basin in the IW and PDSLD areas to flush area soil;
(5) Monitor groundwater;
(6) Continue residential well sampling in conjunction with sampling of the adjacent Spiegelberg Superfund site; and
(7) Implement ICs including deed restrictions, and Site access restrictions such as fencing.

In July 1991, EPA issued an ESD to amend the groundwater cleanup standards for six COCs. The new cleanup standards were equal to or more stringent than MCLs and did not exceed the state's Human Lifecycle Safe Concentration (HLSC) levels.

In July 2001, EPA signed a ROD Amendment that modified the groundwater cleanup standards and the 1991 ROD remedy as follows:

(1) Shut down the groundwater extraction/treatment facility and soil flushing;
(2) Implement *in-situ* groundwater ozone/oxygen oxidation to restore the groundwater to MCLs or current Michigan Part 201 residential DWC;
(3) Prevent off-site migration of contaminants during the remedial treatment;
(4) Prevent plume expansion during the remedial treatment;
(5) Modify the groundwater monitoring program to ensure treatment progress;
(6) Eliminate the semi-volatile organic compound analysis requirement;
(7) Provide contingency plan(s) (which could possibly include Monitored Natural Attenuation [MNA], if applicable);
(8) Continue operation and maintenance of the installed cap;
(9) Continue Site security;
(10) Update the cleanup standards to be consistent with current State and Federal standards, as identified in Table A3.

Table A3

Revised Groundwater Clean-Up Levels (µg/L)		
Contaminant	**1991 ROD**	**ROD Amendment**
Acetone	700	730
Benzene	1.2	5.0
2-butanone	350	13,000
Chlorobenzene	100	100
1,1-dichloroethene (total)	100	170
Ethylbenzene	70	70
1-methyl-2-pentanone	350	1,800
Methylene chloride	5	5
Toluene	800	790
1,1,1-trichloroethane	200	200
Trichloroethene	3	5
Vinyl chloride	1	2
Xylenes (total)	300	280
Bis(2-ethylhexyl)-phthalate	2	6.0
Isophorone	8	770
2-methylphenol	400	370
Lead	5	4.0
Cadmium	4	5.0

The ROD Amendment clean-up levels reflect current EPA drinking water standards (MCLs). Michigan Part 201 cleanup criteria were used for those compounds where MCLs have not been set.

Remedy Implementation

In 1984, 1989 and 1990, EPA removed approximately 3,650 drums of waste and contaminated soils from the Site. In 1995, EPA constructed and completed a cap over the landfill on-Site, as prescribed by the 1991 ROD. The groundwater extraction and treatment system, first commissioned in 1996, was operated until March 2000 for a period of approximately 4 years. The operation of the groundwater extraction treatment system resulted in the reduction of the concentrations of the chemicals of concern to low levels, except for TCE near EW-107 in the southern plume. In early 1997, however, it was apparent that the conditions in the 1991 ROD calling for "Extraction of groundwater to capture and halt flow of the plume" and "halting the migration of contamination" were not being met, based on the hydraulic contour maps generated per month for the Site.

The RSRG assumed responsibility for the site from EPA after the ROD was issued. The RSRG entered into a Consent Decree to perform the Remedial Design and Remedial Action work at the site. The Consent Decree went into effect on April 30, 1992.

EPA's review of the PRPs' groundwater monitoring elevation data indicated a flow of groundwater to the north-northeast. The PRPs made several attempts in 1998 to eliminate flow to the north-northeast by adjusting the extraction well pumping rates. The adjustments, however, did not achieve the desired effect. EPA requested that the PRPs characterize the groundwater escaping to the north-northeast of the plume, and if necessary, take corrective action to address the flow through the plume to the northeast. Subsequently, the PRPs conducted the requested groundwater investigations between the northern edge of the plume identified in the 1991 ROD and Spicer Road. The results from these studies showed a small isolated pocket of benzene and vinyl chloride contamination (slightly above clean-up levels) near Spicer Road (Spicer Road plume). These results prompted EPA to direct the PRPs to investigate additional possible remedial actions to comply with the 1991 ROD requirements.

Subsequently, the PRPs developed and evaluated several remedial technologies, including the expansion of the existing groundwater extraction system, to address the Spicer Road plume. In the summer of 1999, the PRPs submitted a proposal to install an *in-situ* ozone/oxygen oxidation system to treat all remaining residual contamination at the Site. The modified final remedy required the PRPs to implement a new in-situ oxidation/ozone treatment system to treat the residual groundwater contamination at the Site, and to continue to monitor and assess groundwater quality at the Site to ensure that contaminated groundwater did not migrate off-Site, and that the contaminated plumes were contained and treated. Implementation of this proposal, if successful, would restore the groundwater to the ROD Amendment clean-up standards, based on the treatment effectiveness of in-situ ozone/oxygen oxidation at other cleanup sites that have similar geology.

The PRPs proceeded in March 2000 with the purchase, installation and testing of the in-situ ozone/oxygen oxidation, at their own financial risk, pending approval of the amended ROD. The existing groundwater excavation/treatment and soil flushing system was shut down and placed in standby status to allow the groundwater to return to stable pre-treatment conditions, so that the modified remedy could be properly designed to treat the residual contamination. The *in-situ*

oxidation system required the modification of the existing monitoring system by adding two additional monitoring wells, and utilizing select existing wells, consistent with the *in-situ* oxidation requirements. All the zones of the ozone sparge system operated continuously.

An additional requirement of the 1991 ROD was to demonstrate that the soil flushing no longer resulted in VOCs being flushed to the aquifer at concentrations above cleanup values, prior to its shutdown. The PRPs submitted three reports to demonstrate that this had occurred. Subsequently, EPA approved the in-situ oxidation system as part of the alternative remedy for the site.

APPENDIX B – ADDITIONAL SITE INFORMATION

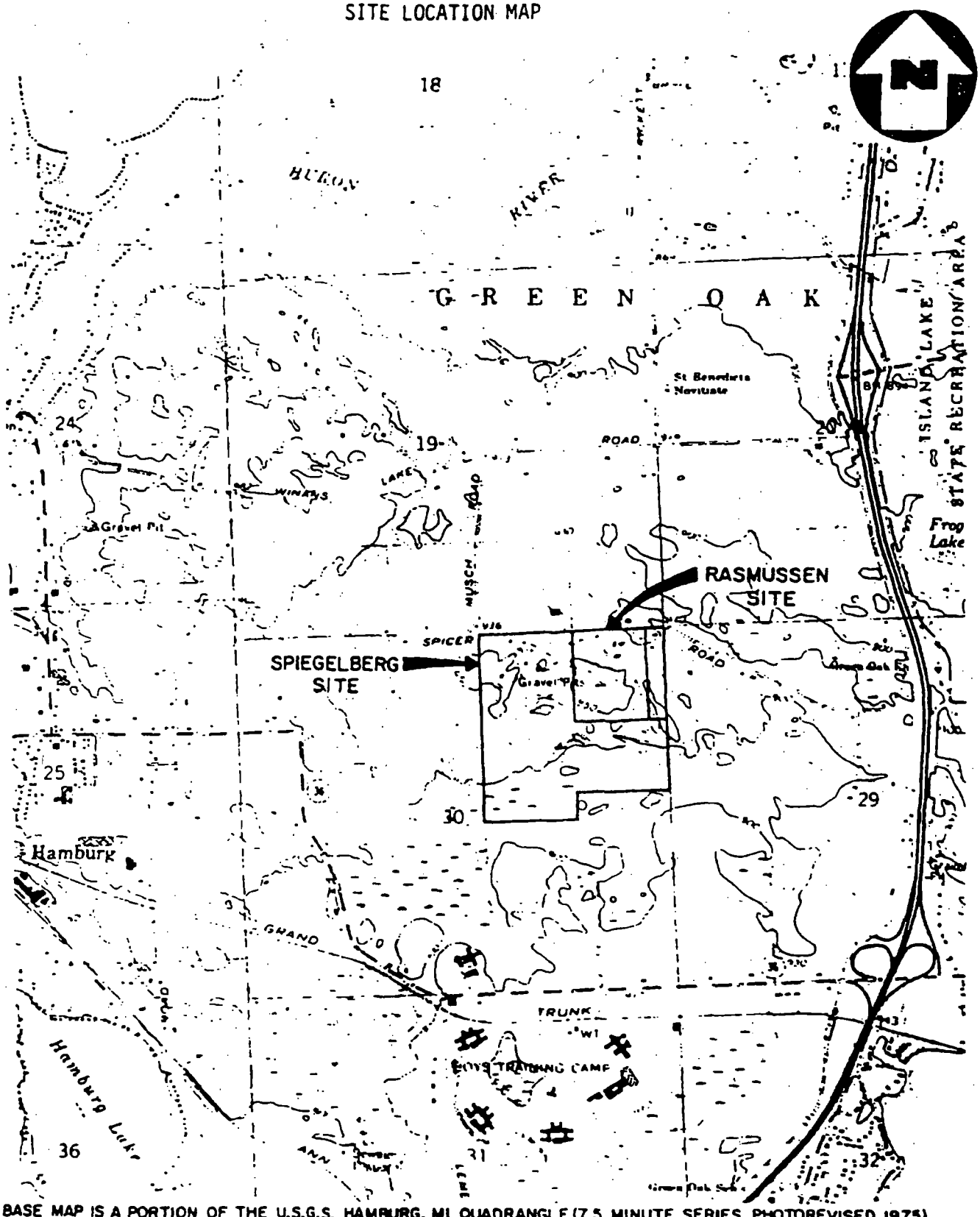
Attachments

A. Site Maps
B. Deed Restrictions
C. Five Year Review Kick-off Letter
D. Site Inspection Report
E. Public Notice
F. Groundwater Monitoring Data Summary and Plume Figures

Attachment A

EXHIBIT 1

SITE LOCATION MAP



BASE MAP IS A PORTION OF THE U.S.G.S. HAMBURG, MI QUADRANGLE (7.5 MINUTE SERIES, PHOTOREVISED 1975). CONTOUR INTERVAL 10'.

FIGURE 1-1

LOCATION MAP

SPIEGELBERG & RASMUSSEN SITES

LIVINGSTON COUNTY, MI

SCALE: 1" = 2000'

NUS CORPORATION

Attachment B

004416 FEB 14 92

RECORDED

FEB 14 2 11 PM '92

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DEED RESTRICTIONS

Pursuant to Paragraph 7 of Stipulation For Access And Other Issues Without Prejudice Between The United States And The Rasmussen Defendants, (Appendix 2) entered in the United States District Court for the Eastern District of Michigan Southern Division on December 26, 1991 (U.S. v. RASMUSSEN, et al., Civil Action No. 88-40010-FL), Clara C. Rasmussen and Gloria F. Rasmussen hereby impose restrictions on the following described real estate, also known as the Rasmussen Site ("Site"), in Livingston County, in the State of Michigan:

> Northeast 1/4 of the Northeast 1/4 of Section 30, excepting the East 262 feet thereof, all in Town 1 North, Range 6 East, Green Oak Township, Livingston County, Michigan. On the Livingston County tax rolls as parcel 100-004.

The following restrictions are imposed upon the real estate described in this document for the purpose of preventing interference with the performance of the final selected remedial action for the real estate pursuant to the Record of Decision ("ROD") (Appendix 3), signed March 28, 1991, by United States Environmental Protection Agency ("U.S. EPA"), pursuant to the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. § 9601 et seq.:

1. There shall be no use of the real estate in any manner that could cause exposure of humans or animals to contaminated groundwater or soils in concentrations that present or may present a threat to health (i.e. concentrations above the Cleanup Standards set forth in ROD);

2. There shall be no residential or commercial use of the real estate that may interfere with the remedial action to be performed at the real estate, pursuant to the ROD. The prohibited uses of the real estate shall include, but not be limited to, any filling, grading, excavating, building, constructing, drilling, mining, farming or other development, except with the prior written approval of U.S. EPA; and

3. There shall be no use of the section of the real estate known as the Facility, as designated by the existing security fence, indicated on the Rasmussen Dump Site Map (Appendix 1), or future location of the security fence on the real estate other than any presence necessary for implementation, completion or monitoring of remedial action under the ROD. The prohibited uses of the Facility shall include, but not be limited to, any filling, grading, excavating, building, constructing, drilling, mining, farming or other development, or placing waste material within the Facility, or any other activity which may damage

any remedial action component contracted or installed pursuant to the ROD, except with the prior written approval of U.S. EPA.

The owners of real estate shall notify U.S. EPA at least sixty (60) days prior to any conveyance of the real estate, or any portion of the real estate. Prior to the conveyance of the real estate, the owners of the real estate shall notify the other party of the conveyance of these Deed Restrictions.

These Deed Restrictions shall run with the land and shall remain in full force and effect.

IN WITNESS WHEREOF, Clara C. Rasmussen and Gloria F. Rasmusssen have caused these Deed Restrictions to be executed this 15th day of January, 1992.

Seal

Clara C. Rasmussen

Gloria F. Rasmussen

ATTEST:

John K. Harris

Ann B. Thurman

State of Michigan)
) SS:
County of Livingston)

Before me, a Notary Public in and for said County and State, personally appeared Clara C. Rasmussen and Gloria F. Rasmussen acknowledges the execution of the foregoing Deed Restriction on the real estate.

Witness my hand and Notarial Seal the 15th day of January, 1992.

John K. Harris
Notary Public

My County of Residence: Livingston
My Commission Expires: 1/23/93

DRAFTED BY: Susan Schneider, Senior Attorney
Environmental Enforcement Section
Environment and Natural Resources Division
U.S. Department of Justice
Washington, D.C. 20530

AFTER RECORDING, RETURN TO SAME.

LIBER 1541 PAGE 0738

LIST OF APPENDIXES

Appendix 1 - Rasmussen Dump Site Map

Appendix 2 - Stipulation For Access And Dismissal Without Prejudice Between The United States And The Rasmussen Defendants, U.S. v. RASMUSSEN, et al., Civil Action No. 88-40010-FL, United States District Court for the Eastern District of Michigan Southern Division

Appendix 3 - Record of Decision for the Rasmussen Dump Site signed March 28, 1991, by United States Environmental Protection Agency

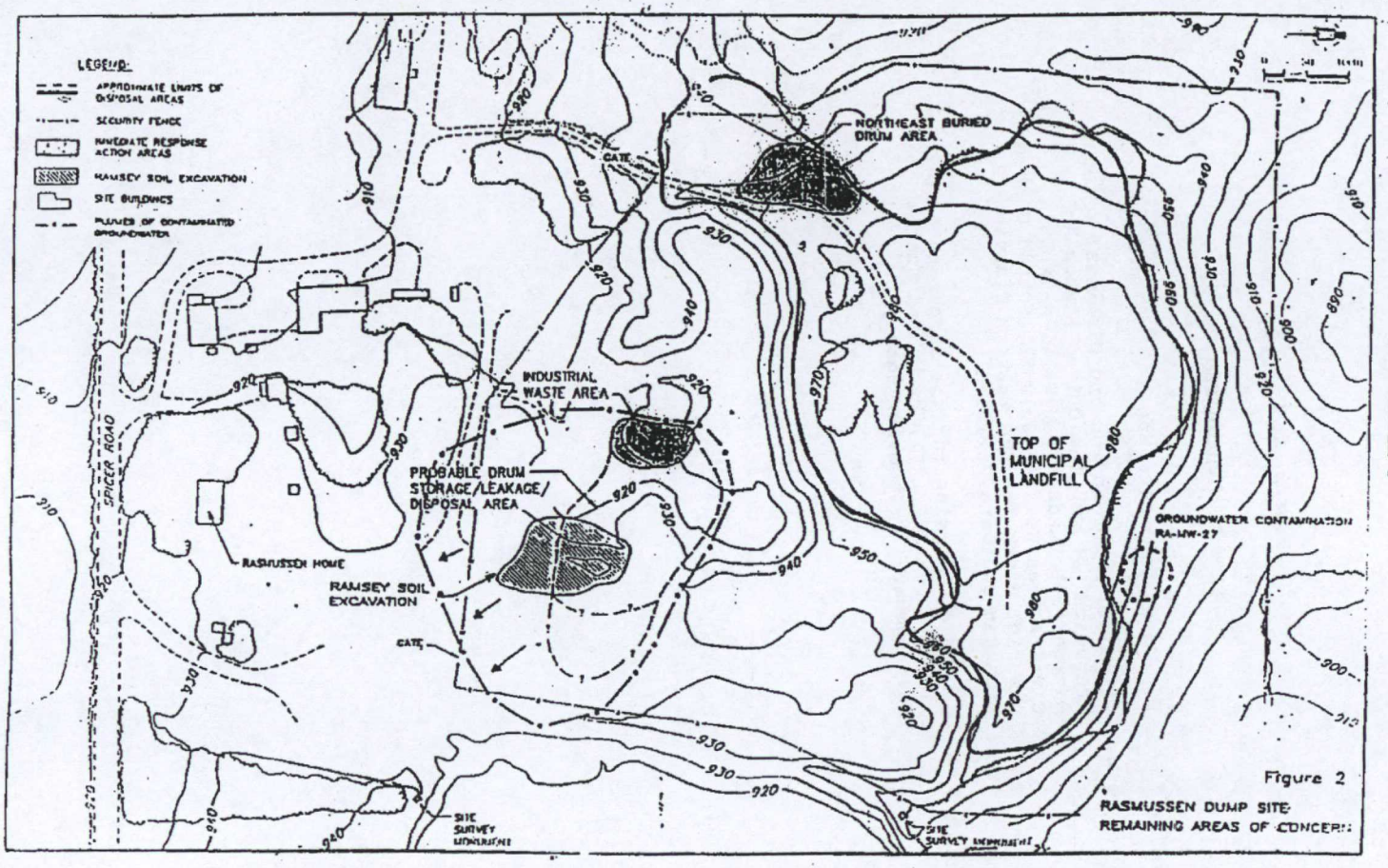

Figure 2

RASMUSSEN DUMP SITE
REMAINING AREAS OF CONCERN

APPENDIX 1

APPENDIX 2

DEC 27 1990

Clerk

U.S. DIST. CT. CLERK
DEC 26 '10 37 AM '90
SOUTHERN DIV. DETROIT

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF MICHIGAN
SOUTHERN DIVISION

UNITED STATES OF AMERICA, Plaintiff, v. HOMER S. RASMUSSEN, GLORIA F. RASMUSSEN, CLARA C. RASMUSSEN, ALFRED E. PEARSON, JR., CHRYSLER MOTORS CORPORATION, FORD MOTOR COMPANY, and HOOVER UNIVERSAL, INC., Defendants.	CIVIL ACTION NO. 88CV40010FL JUDGE NEWBLATT

LIBER 1541 PAGE 0741

STIPULATION FOR ACCESS AND DISMISSAL WITHOUT PREJUDICE BETWEEN THE UNITED STATES AND THE RASMUSSEN DEFENDANTS

Plaintiff, the United States of America, on behalf of the Administrator of the United States Environmental Protection Agency ("EPA"), filed the Complaint in this action on January 8, 1988, alleging that the Defendants are jointly and severally liable to the United States, pursuant to Section 107 of the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"), 42 U.S.C. § 9607, for costs incurred and to be incurred by Plaintiff in responding to the release or threat of release of hazardous substances at a site in Green Oak Township in Livingston County, Michigan (the "Rasmussen Site").

This Stipulation is made and entered into by and between Plaintiff, the United States of America, and the persons defined

JUDGE'S COPY

in this Stipulation as the Rasmussen Defendants (referred to collectively as "the Parties").

The Rasmussen Defendants have represented that they presently lack assets or other financial resources and have provided financial information to support these representations. In reliance on these representations, the United States has agreed to dismiss its cost recovery claims against the Rasmussen Defendants at the present time without prejudice.

1. This Court has jurisdiction over the subject matter of this action and over the Parties to this Stipulation, pursuant to 28 U.S.C. §§ 1331, 1345, 1355, and 1395(a), and CERCLA Sections 107(a) and 113(b), 42 U.S.C. §§ 9607(a) and 9613(b).

2. The following definitions shall apply in this Stipulation:

A. "Hazardous Substances" shall have the meaning provided in Section 101(14) of CERCLA, 42 U.S.C. § 9601(14).

B. "Rasmussen Site" or "Facility" means the property located on Spicer Road in Green Oak Township, Livingston County, Michigan, as shown on the map attached as Exhibit 1. The Rasmussen Site was formerly operated as the Green Oak Township Dump.

C. "Response Costs" means any costs not inconsistent with the National Contingency Plan relating to the Rasmussen Site, incurred by Plaintiffs pursuant to 42 U.S.C. § 9601 et seq.

D. "Rasmussen Defendants" means the following Defendants: Homer S. Rasmussen; Gloria F. Rasmussen; and Clara C. Rasmussen.

E. "United States" means the United States of America.

F. "EPA" means the United States Environmental Protection Agency.

3. Between October 31, 1984 and January 11, 1985, EPA performed an immediate removal action at the Rasmussen Site pursuant to Section 104 of CERCLA, 42 U.S.C. § 9604, and the National Contingency Plan, during which EPA incurred Response Costs.

4. The objective of this Stipulation is to arrange for access to the Facility and to dismiss the action filed against Rasmussen Defendants without prejudice.

5. The Parties understand that response actions other than those referred to in Paragraph 3, have been and are being conducted at the Rasmussen Site and that additional response actions may be necessary in the future. This Stipulation does not address and does not resolve any liability that the Rasmussen Defendants or any other parties may have in connection with any past, present or future response actions at the Rasmussen Site.

6. Access to the Rasmussen Site: As of the date of this Stipulation, the Rasmussen Defendants each agree that the United States and the State of Michigan, all federal and/or state contractors and authorized representatives, and all entities

conducting any EPA-approved remedial design or remedial action at the Rasmussen Site pursuant to an Administrative Order or judicially-approved settlement, shall have access at all times to the Rasmussen Site, and shall have access to any other property controlled by or available to the Rasmussen Defendants to which access is necessary to effectuate any remedial design or remedial action. Access shall be allowed for the purposes of conducting activities related to these actions, including but not limited to:

a. Monitoring the work or any other activities taking place at the Rasmussen Site;

b. Verifying any data or information submitted to the United States or the State of Michigan;

c. Conducting investigations relating to contamination at or near the Rasmussen Site:

d. Obtaining samples;

e. Assessing the need for, planning, or implementing additional response actions at or near the Rasmussen Site;

f. Inspecting and copying records, operating logs, contracts or other documents maintained or generated by anyone associated with any remedial design or remedial action activities at the Rasmussen Facility; or

g. Assessing Rasmussen Defendants' compliance with this Stipulation.

7. Deed Restrictions: The Rasmussen Defendants shall agree to reasonable and necessary deed restrictions regarding the Rasmussen Site, as determined by EPA, following EPA's selection of a remedial action for the Rasmussen Site in a Record of Decision and consistent with the requirements of Section 121 of CERCLA, 42 U.S.C. § 9621.

8. Access Authority Retained: Nothing herein shall restrict in any way the United States' access authorities and rights under CERCLA, RCRA or any other applicable statute, regulation or permit.

9. By his/her signature to this Stipulation, each Rasmussen Defendant certifies to the best of his/her knowledge and belief that the information he/she has given the United States regarding his/her income and financial status is true, correct and complete. The United States reserves all rights it may have to bring any action against any Rasmussen Defendant if the information provided by or on behalf of that Rasmussen Defendant is not true, correct and complete.

10. The United States expressly reserves, and this Stipulation is without prejudice to, all rights that the United States may have against any Rasmussen Defendant or any other person.

11. Nothing in this Stipulation shall constitute or be construed as a release or a covenant not to sue regarding any claim or cause of action against any person, firm, trust, joint venture, partnership, corporation or other entity, whether or not

a signatory to this Stipulation, for any liability it may have arising out of or relating to the Rasmussen Site. The United States expressly reserves all claims, demands, and causes of action, either judicial or administrative, past or future, in law or equity, against any person or entity for any matter arising at the Rasmussen Site.

12. Nothing in this Stipulation limits the authority and rights of the United States under Sections 104 and 106 of CERCLA, 42 U.S.C. §§ 9604 and 9606, or any other applicable law to take any and all response actions authorized by law.

13. The Complaint filed in this action by the United States is hereby dismissed without prejudice and costs as to each Rasmussen Defendant pursuant to Rule 41(a) of the Federal Rules of Civil Procedure.

14. The Rasmussen Defendants shall make no claim against the United States or the Hazardous Substances Superfund, under any provision of law, including any claim pursuant to Sections 111 and 112 of CERCLA, 42 U.S.C. §§ 9611 and 9612, or pursuant to any other statute, regulation, common law or legal theory, or for attorney fees related to this action. Nothing in this Stipulation shall be deemed to constitute preauthorization of a claim within the meaning of Section 111 of CERCLA, 42 U.S.C. § 9611 or 40 C.F.R. § 300.25(d).

15. This Stipulation may be executed in two or more counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument.

U.S. V. RASMUSSEN, ET AL., 88CV40010FL

BY THEIR COUNSEL, THE PARTIES ENTER INTO THIS STIPULATION AND SUBMIT IT TO THE COURT, THAT IT MAY BE APPROVED AND ENTERED.

For Plaintiff, the United States of America:

12-18-90
Date

RICHARD B. STEWART
Assistant Attorney General
Environment and Natural Resources Division
United States Department of Justice

9/24/90.
Date

VALDAS V. ADAMKUS
Regional Administrator
United States Environmental Protection Agency
Chicago, Illinois 60604

12-26-90
Date

STEPHEN J. MARKMAN
United States Attorney
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Federal Building
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Detroit, Michigan 48226

11/18/90
Date

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Senior Attorney
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Environment and Natural Resources Division
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U.S. V. RASMUSSEN, ET AL., 88CV40010FL

12-26-90
Date

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9/7/90
Date

Peggy Andrews
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Assistant Regional Counsel
Office of the Regional
Administrator
United States Environmental
Protection Agency
111 West Jackson Street
Chicago, Illinois 60604

For Defendant, Homer S. Rasmussen:

7/23/90
Date

Homer S. Rasmussen
HOMER S. RASMUSSEN

7/30/90
Date

DANIEL P. KING
KOHL, SECREST, WARDLE, LYNCH, CLARK
AND HAMPTON
30903 Northwestern Highway
P.O. Box 3040
Farmington Hills, Michigan 48333-
0040

For Defendant, Gloria F. Rasmussen:

7/23/90
Date

Gloria F. Rasmussen
GLORIA F. RASMUSSEN

U.S. V. RASMUSSEN, ET AL., 88CV40010FL

7/30/90
Date

DANIEL P. KING
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for Defendant, Clara C. Rasmussen:

7/23/90
Date

Clara C. Rasmussen
CLARA C. RASMUSSEN

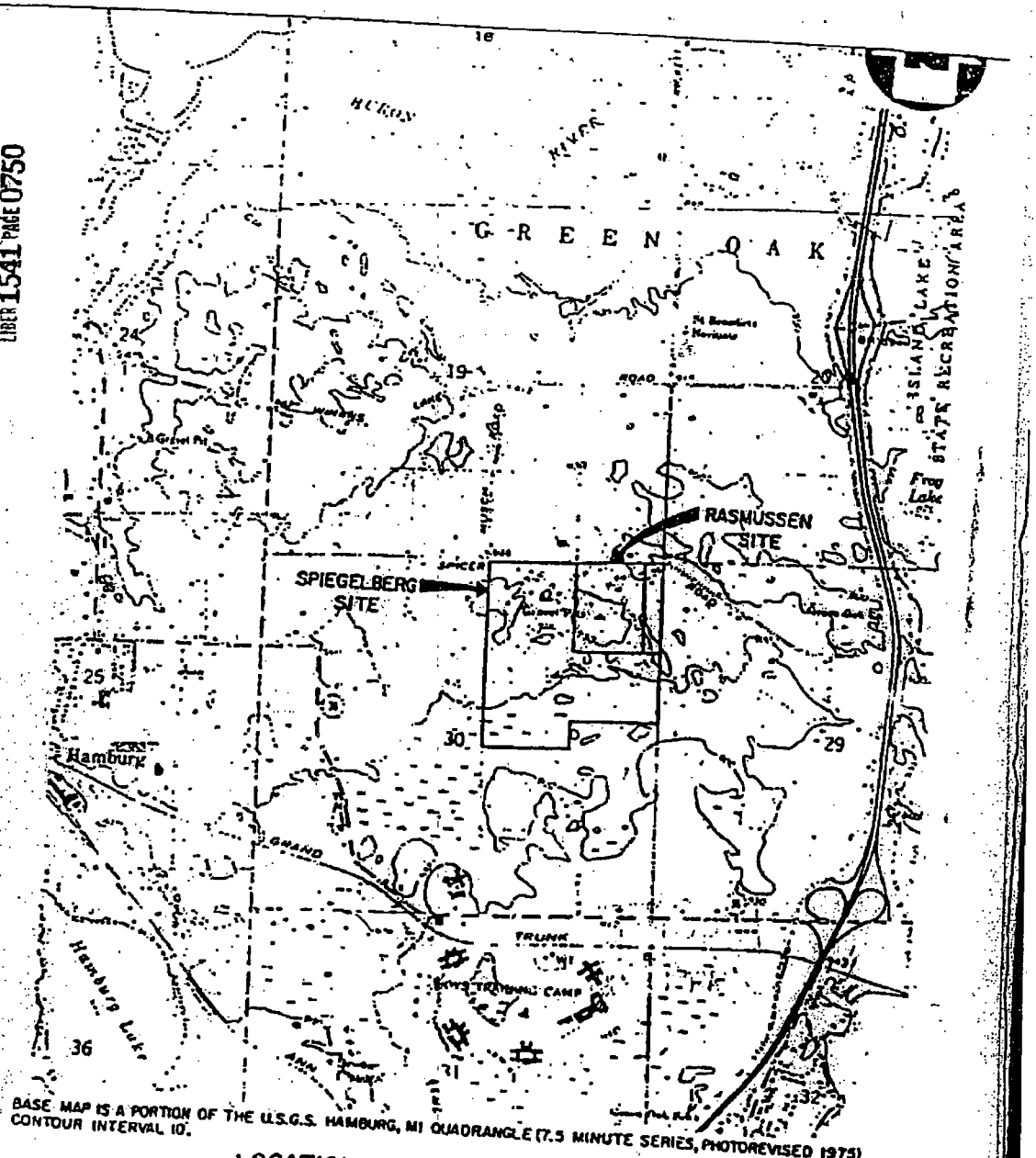
7/24/90
Date

JOHN K. HARRIS
HARRIS & LITERSKI
810 East Grand River Avenue
Brighton, Michigan 48116

IT IS SO ORDERED, THIS 26th DAY OF December, 1990.

STEWART A. NEWBLATT
United States District Judge

12/26/90



BASE MAP IS A PORTION OF THE U.S.G.S. HAMBURG, MI QUADRANGLE (7.5 MINUTE SERIES, PHOTOREVISED 1975). CONTOUR INTERVAL 10.

LOCATION MAP
SPIEGELBERG & RASMUSSEN SITES
LIVINGSTON COUNTY, MI
SCALE: 1" = 2000'

FIGURE 1-1

NUS CORPORATION

DECLARATION FOR THE RECORD OF DECISION

Site Name and Location

Rasmussen Dump Site
Green Oak Township, Livingston County, Michigan

Statement of Basis and Purpose

This decision document presents the selected final remedial action for the Rasmussen Dump Site, in Livingston County, Michigan. The final remedial action was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision document explains the factual and legal basis for selecting the remedy for this site.

This decision is based upon the contents of the administrative record for the Rasmussen Site. The Administrative Record Index is included as Appendix 1.

The United States Environmental Protection Agency (U.S. EPA) and the Michigan Department of Natural Resources (MDNR) agree upon the selected remedy.

Assessment of the Site

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

Description of the Selected Remedy

This final response action addresses the Rasmussen groundwater plume area of concern (the remaining principal threat), the four Rasmussen soils areas of concern, and any drums or concentrations of industrial waste encountered during the implementation of response activities on the groundwater and soils.

The Remedial Investigation (RI) and associated Risk Assessment Report for the Rasmussen Dump site identified areas of concern including areas of disposed hazardous waste, contaminated soils, and groundwater. Two interim source control measures were completed at this site.

1. In the fall of 1984, the U.S. EPA Emergency Response Team removed nearly 3,000 drums and 250 cubic yards of contaminated soils from the top and south face of the dump.

2. In early 1990, the Potentially Responsible Parties (PRPs) concluded the voluntary removal of roughly 650 drums, waste and associated visibly contaminated soils from the Northeast Buried Drum (NEBD) area, Top of Landfill (TML) area, and the Industrial Waste (IW) area. This was carried out under the directive of the U.S. EPA Administrative Consent Order of August 24, 1989.

These removal actions significantly reduced the quantity of containerized waste, reducing a portion of the principal threat posed to public health, soil and groundwater resources.

The final remedial action chosen for the Rasmussen Dump Site, and described in the attached Record of Decision will:

* reduce the potential for human exposure to hazardous substances in the contaminated groundwater resource;

* reduce the potential for human exposure to hazardous substances from contact with contaminated soil areas;

* reduce the potential for remaining hazardous substances to contaminate other resources.

The principal threats will be mitigated by the groundwater extraction and treatment system. Reintroduction of treated groundwater through the Probable Drum Storage, Leakage, Disposal (PDSLD) area and the IW area will flush the contamination into the closed-loop groundwater extraction and treatment system, where they will be removed. This will eliminate current and potential threats to the groundwater resource from these two areas. The low-level threats posed by contact with, or further migration of contaminants toward the groundwater resource in the remaining soils areas (NEBD and TML), are mitigated by construction of a Michigan Act 64 clay cap over these areas, with the additional protection afforded by fencing and deed restrictions. The remedy will be closely monitored throughout implementation and corrective action will be taken, should monitoring indicate the ineffectiveness of any component of the remedy.

The remedy chosen to address the two areas of groundwater contamination and the IW and PDSLD soils areas includes:

* extraction of groundwater to capture and halt the flow of the plumes.
* removal of heavy metal contaminants by chemical precipitation followed by pH adjustment (if necessary).

- removal of several organic contaminants, including ketones, by a biological treatment system.
- removal of residual organic contaminants via air stripping.
- further removal of residual organic contaminants via granular activated carbon (GAC) (or other carbon adsorption methodology, if necessary).
- discharge of treated water to the groundwater via a seepage basin situated over the IW and PDSLD soils areas of concern.
- groundwater monitoring through a system of wells to assess the effectiveness of the system at:
  - halting the migration of contamination.
  - reducing the levels of contamination in the soils and groundwater, over time.
- a process effluent sampling program to aid in determining the treatment system's effectiveness.
- fencing and deed restrictions, as necessary, to ensure the integrity of the remedy.

Residential well sampling will be continued, in conjunction with that called for in the final remedial actions at the neighboring Spiegelberg Superfund Site.

The final processes to be installed for groundwater cleanup will be determined by treatability studies during design.

In the location of groundwater monitoring well RA-MW-27, groundwater will need to be purged from this location and will need to be manifolded into the treatment system feed supply line for treatment prior to discharge.

The final remedial actions to address the threat posed by the TML and NEBD soils areas of concern include:

- A Michigan Act 64 clay cap constructed over all wastes in the TML and NEBD areas of concern as they now exist spatially on-site. This includes:
  - a one-foot thick vegetated soil layer on top,
  - a drainage layer at least 1 foot thick, and
  - a layer of compacted clay 3 feet thick with a permeability of 1E-07 cm/sec or less.
- A groundwater monitoring program established at appropriate locations, depths, and frequency, to detect any changes in groundwater quality, which would indicate any failure of the unit.
- Access restrictions, such as fencing, will be placed around the capped soil areas.
- Institutional controls, such as deed restrictions, will be put in place to prevent future intrusive land uses.
- Drums of waste which are currently visible, or which are unearthed during cap implementation, will be disposed of at a licensed RCRA facility.

This portion of the final remedial action will require long-term management to ensure that the integrity of the capping system is not compromised. The access restrictions and fencing will aid in this effort. Long-term management efforts will include periodic well sampling, cap inspection and repair (if necessary), and maintenance of vegetative cover.

Details of the capping construction such as the potential employment of terracing, rip-rapped drainage channels, and perimeter runoff collection will be detailed during the design phase of remedial action.

Declaration of Statutory Determinations

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the final remedial action, and is cost-effective.

This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable, although it does not entirely satisfy the statutory preference for treatment as a principal element. Portions of the groundwater/soils remedy reduces contaminant toxicity, mobility, or volume through treatment of the principal threat. However, treatment of the low-level threats posed by the soils areas to be capped, was not found to be practicable or cost effective. Drummed industrial wastes, a former principal threat at the site, has been largely eliminated through previous removal actions.

A review will be conducted within five years after commencement of the final remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment, because this remedy will result in hazardous substances remaining on-site above health-based levels.

Valdas V. Adamkus
Regional Administrator
U.S. EPA - Region V

March 28, 1991
Date

DECISION SUMMARY FOR THE RECORD OF DECISION

Site Name, Location, and Description

The Rasmussen property, located in Green Oak Township, Livingston County, Michigan, consists of approximately 33 acres. The contaminated areas take up approximately one third of the Rasmussen property. Figure 1 is a map of the site location within the State of Michigan. It is bounded on the west and south by the Spiegelberg property, another Superfund site. A Rasmussen relative owns the property to the east, and Spicer Road follows the northern property line. The homestead located on the northern portion of the property is a Centennial Farm. Located next to the homestead is a small automobile body shop operated by the property owners. Although still largely wooded, the surrounding properties support some residential and agricultural development. All residences and small businesses have on-site drinking water wells, as there are no municipal water distribution systems in the vicinity. The residential well at the Rasmussen residence is approximately 250 feet from the leading edge of the contaminated groundwater contamination plume, and is in the direction of groundwater flow.

The legal description of the Rasmussen property is:

> Rasmussen property, Spicer Road, Livingston County, Michigan.
>
> Section 30, T1N, R6E, A NE 1/4 of NE 1/4, EXC E 262 feet thereof.

The site is located in an area of rolling hills that were deposited by glacial processes. Surface features include ponds and swampy areas to the south and east of the Rasmussen site. Soils consist of sands, gravel and clays underlain by Bayport Limestone of the Mississippian system. The sand and gravel deposits had been commercially mined, largely changing the original topographic contours. Investigations have shown that two glacial drift aquifers are present beneath the Rasmussen Dump site separated by a silt and clay confining layer .

The aquifer underlying the site is a Class I aquifer, as it is "(1) highly vulnerable to contamination because of the hydrological characteristics" and (2) characterized by groundwater that is irreplaceable (no reasonable alternative source of drinking water is available).

Site History and Enforcement Activities

The Rasmussen Dump, which accepted domestic and industrial wastes during the 1960's and early 1970's, forms a ridge-like crest across the southern portion of the site and property. Drummed and other industrial wastes were also disposed of at other locations on-site. Numerous incidents of burning were reported during the dump's operation. Several attempts were made by the

Figure 1 - Rasmussen Site

county and state to bring the Rasmussen dump into compliance with State laws, but the dump was never properly capped and "closed" prior to termination of landfill operations in 1977. Sand and gravel mining, which began after closure in 1977, undermined the landfill and resulted in the redistribution of fill and drummed wastes.

Low levels of groundwater contamination were detected in a 1981 study conducted by the MDNR. U.S. EPA's Field Investigation Team conducted a site inspection in 1982, and the site was scored and placed on the Federal National Priorities List (NPL) of hazardous waste sites in 1983.

In October and November of 1984, the U.S. EPA Emergency Response Team removed roughly 3,000 drums and 250 cubic yards of contaminated soils from the top and south face of the dump. By December of 1984, a State-lead Remedial Investigation was initiated (U.S. EPA was the Support Agency). Late in 1985, MDNR constructed an eight-foot high chain-link fence around an area which had been determined to contain various organic chemicals, low level dioxins and PCBs.

The report of findings for the Remedial Investigation was issued in September of 1988. Based on the findings of the Remedial Investigation, the Agencies were able to delineate discrete areas of buried drums and contaminated soils. U.S. EPA issued an Administrative Consent Order, under Section 106(a) of CERCLA, for the removal of the drums, wastes, and associated visibly contaminated soils from three of the soils areas--the Northeast Buried Drum (NEBD) Area, Top of Landfill (TML) Area (although labeled a "landfill" in the RI, this dumping area was never a licensed fill), and Industrial Waste (IW) Area. Eleven PRPs signed the Order which became effective on August 24, 1989. This second removal action began in December of 1989.

Roughly 650 drums were unearthed and staged on-site pending disposal authority. Waste screening prior to disposal indicated that the contents of three drums contained waste with a pH of 12 or greater. Preliminary flammability screening indicated that approximately half of the containers may have contained flammable contents. PCB composites (5 drums per composite) showed levels as high as 270,000 ppm, while 80 percent of the composites showed detectable levels of PCBs. Eight containers were found to contain liquids. All excavated wastes were manifested as hazardous and transported to approved RCRA facilities. Figure 2 outlines the locations of each remaining area of concern on the Rasmussen site.

In June of 1987, the landowner sold approximately 7,000 cubic yards of contaminated soil (identified as "Ramsey Soil Excavation" on Figure 2) from the fourth area of concern--the Probable Drum Storage, Leakage, Disposal (PDSLD) Area. The State

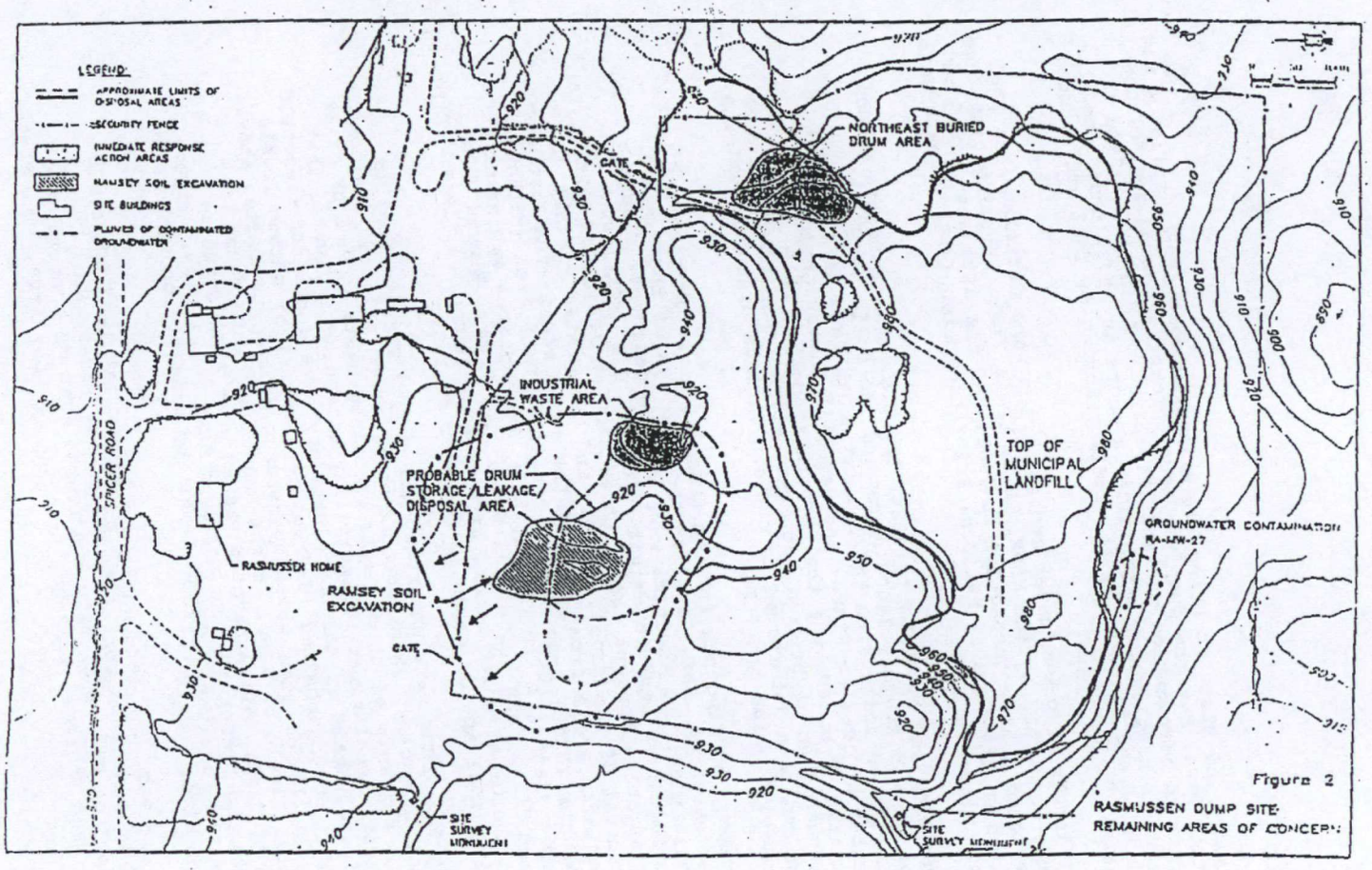


Figure 2

RASMUSSEN DUMP SITE
REMAINING AREAS OF CONCERN

obtained a temporary restraining order 1) against further movement of the soils, 2) for return of the soils by the landowner and the purchaser of the contaminated soils, and 3) for unrestricted access for the State and U.S. EPA to further their investigative activities (Civil Action No. 87-8917, Circuit Court, Livingston County). The soils were returned to the Rasmussen property, and the landowner and purchaser are required to repay portions of the State's costs incurred in pursuing this action.

The Feasibility Study Report, prepared by MDNR, reviewed by U.S. EPA, and released for public comment on January 16, 1990, is also based on the findings of Remedial Investigation and Risk Assessment Reports. Subsequent to the completion of the Feasibility Study, further soil boring investigations and analyses were conducted from December of 1989 through January of 1990, on the PDSLD Area. The results of these investigations are detailed in a Technical Memorandum, attached hereto as Appendix 3, and have been added to the Administrative Record.

Potentially Responsible Parties (PRPs) have been identified by U.S. EPA for the Rasmussen site. A General Notice Letter was issued to the identified PRPs in September 1988. Special Notice Letters will be issued to the PRPs after this Record of Decision has been signed.

Highlights of Community Participation

A complete chronology of community relation activities for the Rasmussen site is provided as part of the attached Responsiveness Summary. This past year's activities include the issuance of the Feasibility Study (FS) Report for the Rasmussen site on January 16, 1990. Site information including the FS have been and continue to be available to the public as part of the administrative record, which is housed at three information repositories: the EPA Docket Room for Region V, in Chicago, Illinois, and at both the Brighton City and the Hamburg City Libraries, near the site. The notices of availability of the Feasibility Study and Proposed Plan were published in the Brighton Argus, the Ann Arbor News, and the Detroit News/Free Press. A Proposed Plan detailing the Agency's preferred alternative was issued on August 31, 1990, initiating the public comment period. A public meeting was held on September 13, 1990 at the Green Oak Township Hall. The meeting included a drop-in availability session, a formal hearing, and an informal question and answer period. The availability session was held in the early afternoon. At that session MDNR and US EPA staff were available for informal discussion on the RI/FS, the Proposed Plan, or any other subject related to this site or the adjacent Spiegelberg Superfund site. The public hearing was held in the evening, and addressed comments on the Rasmussen site. An informal question and answer session for both sites followed the

hearing. Responses to the comments received during the public comment period are included in the Responsiveness Summary, which is part of this Record of Decision.

Scope and Role of Response Action Within Site Strategy

Removal actions, as previously mentioned, have significantly reduced the quantity of containerized waste and contaminated soils at this site, permitting the final remedy, as described in this ROD, to address the remaining risks posed by the soil and groundwater contamination.

Summary of Site Characteristics

In September of 1988, the MDNR and U.S. EPA issued a Remedial Investigation Report for the Spiegelberg and Rasmussen sites. During the investigation, the areas of concern were identified as: 1) the Rasmussen groundwater plume, and 2) the four soils areas (PDSLD, IW, NEBD, TML). A Risk Assessment was also completed and issued as a separate document simultaneously with the Remedial Investigation Report. Specific contaminants detected in each area of concern are found in the Tabulations provided in Appendix 2. Appendix 3 presents the results of the supplemental soil investigation of 1989/1990. The Tables reflect pre-removal contaminant levels. Generally, both carcinogenic and non-carcinogenic compounds were found to be present in the Rasmussen soils and groundwater plume. To summarize:

* Drummed wastes were disposed of in an area referred to as the Top of the Municipal Landfill (TML). Periodic fires in this area may have been the source of the low levels of dioxins and dibenzofurans identified in this area. Soils not removed contained PCBs as high as 61 ppm. This is an area of concern due to the potential dermal threat posed by the PCBs and benzo(a)pyrene remaining in the surface soil, and the potential threat to groundwater from leaching of contaminants through the soils. Refer to Tables 2-5, 2-8 and 2-9 of Appendix 2 for contaminant levels found in this area. As mentioned, the majority of drummed wastes have been removed from this area. Surface soils in this area contain dioxins from the burning of wastes, averaging less than 1 ppb.

* The dump (TML) also consists of decomposed and non-degradable domestic trash, and some scrap metal. These wastes cover approximately 6 acres, and range from roughly 5 feet thick on the north edge, to greater than 50 feet thick on the south side. Post-removal observations have shown that scattered drums are partially buried in the dump and adjacent soils areas. Weathering and soil slumping continue to expose new drums.

- A buried drum area was intermingled with the municipal wastes in the northeast portion of the municipal landfill. This area is referred to as the Northeast Buried Drum (NEBD) area of concern. Drums, associated wastes, and contaminated soils located in the NEBD were found to contain high levels of volatile organic compounds, semi-volatile organic compounds and PCBs, and posed both a threat to groundwater and a dermal threat to humans. All drummed wastes have been removed from this area. Refer to the "Site History and Enforcement Activities" section for details of this removal. Refer to Table 2-14 of Appendix 2 for contaminant levels found in this area prior to the removal. This area currently poses a potential risk to groundwater from residual soil contamination.

- The Industrial Waste (IW) area is an area where mixed paint wastes and drums were found within the gravel pit at the center of the northern toe of the municipal landfill. Volatile organic constituents and PCBs characterized this area, presenting dermal and groundwater threats. Risks have been reduced by removal of drummed waste and some contaminated soils from this area, as previously discussed. Refer to Table 2-15 of Appendix 2 for contaminant levels found in this area prior to removal activities. This area continues to pose a potential threat to the groundwater resource from residual soil contamination.

- Testing of subsurface soils and recent gravel mining have revealed an area where leakage of drums and/or bulk disposal of liquid may have occurred. This area of concern is referred to as the Probable Drum Storage, Leakage, Disposal (PDSLD) area. Refer to Table 2-16 of Appendix 2 and Appendix 3 for contaminant levels found in this area. Limited investigations were conducted in this area during the RI. At the completion of the RI, data indicated that contamination existed in isolated lenses in the PDSLD unsaturated zone. The supplemental soils investigation of 1989/1990 gave a clear indication that the majority of contaminants are not being retained in the upper unsaturated soils, but have migrated through the upper soils in this area, and are now found either in the soils above the groundwater table, or in the groundwater itself. The contamination in the soils in this area is considered a current continuing threat to groundwater.

- The PDSLD/IW areas combined comprise roughly 9,400 cubic yards of varying degrees of contaminated soil above the groundwater table.

- The northern (and largest) groundwater contamination plume appears to have originated from the PDSLD/IW areas of concern. It is estimated to have traveled roughly 500 feet

in a north-northwesterly direction (Figure 2) and contains a large number of organic compounds. It is estimated that 3.3 million cubic feet of contaminated groundwater exists beneath the site. Groundwater flow rate is 173 feet per year in the upper aquifer and 204 feet per year in the lower aquifer. However, contaminants within the plume do not appear to be moving at the same rate as the groundwater.

* The groundwater in the vicinity of RA-MW-27 (southwestern toe of the dump) was confirmed to be contaminated with trichloroethene above groundwater cleanup levels. This confirmation was a result of re-evaluation of existing Remedial Investigation results and on subsequent PRP sampling events. Although limited in extent, this area requires remediation. Both areas of groundwater contamination are delineated on Figure 2.

* As noted above, the glacial aquifer used for water supply is presently contaminated by the Rasmussen plumes. Continued migration of the plumes poses a potential threat to water supply wells north and northwest of the site, although no wells beyond the site are presently contaminated by the plumes. Also considered is the fact that the groundwater at the site is potentially usable, and no reasonable alternative source of water exists.

* The actual or threatened release of hazardous substances from this site, if not remedied by the selected alternative, may present an imminent and substantial endangerment to public health, welfare, or the environment.

Summary of Site Risks

The 1988 Remedial Investigation and Risk Assessment Reports detailed the site characteristics and risks prior to the 1989/1990 removal action, and without the benefit of information gained during the 1989/1990 supplemental soils investigation. Some of the site-specific details and assumptions used in the calculation of risk at that time differ from that which is characteristic of the Rasmussen site in its current state. The following discussion of the Rasmussen site risks describes the general concepts used in the RI and Risk Assessment to determine risk posed and chemicals of concern, and identifies those aspects of risk calculation that are still applicable after the removal and additional findings. Integrated with the discussions of current risks are discussions of groundwater chemicals of current concern and their corresponding cleanup levels, and the rationale for the soil remediation compliance points, in order to protect public health and the environment.

Human Health Risks

The following discussion of the Rasmussen site risk describes the general concepts used in the RI and Risk Assessment to determine chemicals of concern, risks posed by these chemicals, and impact on risks by the removal actions.

Contaminant Identification

As noted previously, Appendix 2 contains contaminant concentration summaries for the Rasmussen areas of concern, which were taken from the Risk Assessment. Appendix 3 contains additional information on the PDSLD, excerpted from the 1989/1990 Soils Investigation Technical Memorandum. Section 3-2 of the Risk Assessment describes the indicator chemical selection process and Table 3-1 in Appendix 4 here, lists the selected indicator chemicals for that assessment. The Risk Assessment tabulations represent the concentrations found during the Remedial Investigation samplings prior to the 1989/1990 removal of 650 drums and some associated soils. Contaminant concentrations reported in the Risk Assessment tabulations were a combination of surface soil and subsurface soil/waste samples. Many of the higher concentrations reported were from wastes found in close association with the drums in the NEBD, TML and IW areas, which have now been removed.

Exposure Assessment

The exposure assessment portion of the Risk Assessment identified the potential exposure pathways and receptors. Identified pathways and receptors were used in conjunction with assumptions of exposure frequency and duration, to model exposure point concentrations.

A. Pathways

Three factors were used to identify exposure pathways:

* Chemical source and release mechanisms to the environment.
* The environmental transport medium for the released chemical.
* The point of potential receptor contact with contaminated media.

1. Groundwater

During the performance of the Risk Assessment, risk calculations included factors for transport of chemicals from surface or subsurface waste deposits to the groundwater. These groundwater

scenarios included direct percolation of liquid wastes and/or solubilization of solid or semi-solid wastes, and lateral transport of these wastes toward a receptor at Spicer Road. The average and maximum source concentrations of contaminants used to initiate these transport model calculations were often those taken from drummed waste, now removed from the IW, NEBD and TML areas.

The contaminants currently found in all four soils areas and groundwater now represent the source to the environment and human receptors, with the groundwater resource underneath each area of concern being the point of potential receptor contact--and not Spicer Road. The groundwater underneath the Rasmussen site is potentially usable, and thus requires protection and restoration. Likewise, based on existing hydrogeologic and chemical analytical data, contaminants currently in the groundwater, if not remedied, will migrate northward, eventually reaching the property boundary and may potentially impact existing or new wells.

The scenario for point of potential receptor contact with contaminated groundwater does not change based on prior removal actions. Potential receptors are likely to be exposed to contaminants in groundwater via normal domestic uses. With reference to risk, ingestion is the primary point of potential receptor contact. Inhalation of volatilized contaminants during showering or bathing is a secondary exposure route. Dermal absorption of organic compounds through water usage could also occur, but studies have shown this to be an insignificant exposure route in contrast to ingestion or inhalation.

2. Soils

As explained above, the soils areas were considered as potential sources of groundwater contamination in the Risk Assessment. Dermal contact with, accidental ingestion of, and inhalation of volatile organic contaminants and fugitive dust from surface soil contamination were also considered as pathways in the Risk Assessment. The Risk Assessment analyses found that due to very low concentrations of contaminants in RI air samples, routine release of contaminants through volatilization or fugitive dust is not significant. Particulate air monitoring conducted as part of the 1989/1990 drum excavation activities, during which a fair amount of soil and waste disturbance occurred, did not show elevated airborne contaminant levels. Contaminants remaining in these soils areas after removal, currently pose a reduced dermal contact risk from that which was assessed in the Risk Assessment. Appendix 4 attached provides the list of indicator chemicals from the Risk Assessment. The 1989/1990 supplemental soils investigation has shown that surface soils remaining in the PDSLD area do not pose a significant dermal or inhalation risk These results are included as Appendix 3.

The likelihood of persons coming in contact with the contaminated soils (direct contact or accidental ingestion) has been essentially eliminated by the eight-foot high chain link fence, topped with three strand barbed wire, constructed around all soils areas of concern during 1985.

The remaining risk posed by the soil areas of concern, listed in Table 3-6 of Appendix 5, is primarily via their current potential contribution to the site's groundwater contamination through percolation or by interaction with the fluctuating groundwater interface. Specifically, the PDSLD/IW area poses a current risk to groundwater due to the presence of soil contaminants in close association with the groundwater, as indicated by the supplemental soils investigation results in Appendix 3. The TML and NEBD contaminated soils that remain also present a potential risk to groundwater.

B. Potentially Exposed Populations

For the purposes of the ingestion scenario exposure assessment, people who now, or will at sometime in the future, reside in the downgradient direction of groundwater flow (north-northwest) were considered potential receptors. Analysis of groundwater samples collected during the RI and in May/June 1990 indicate that the groundwater contamination plumes have not migrated beyond the site boundary, and that residential wells belonging to potential receptors are currently unaffected by the Rasmussen groundwater contamination plumes. As noted previously, the Rasmussen residential well, located approximately 250 feet distant from the leading edge of the plume, is the closest currently existing potential receptor. Other currently existing potential receptors within one mile of the site in the downgradient direction are limited to roughly 5 households and one VFW Hall.

For purposes of assessing the risk posed by the direct contact with or inhalation of contaminants from soils and wastes, persons who would be trespassing within the confines of the fenced area, or who would potentially be exposed through the occupational scenario, were considered potential receptors.

The property immediately to the north of the Rasmussen site is zoned residential, and a developer is currently pursuing options for building. Assessment of potentially exposed populations for the future scenario includes the potential use of the groundwater resource at the Rasmussen site. As will be explored in detail further on, this is the basis for the chosen groundwater and soil remediation.

C. Exposure Estimates and Assumptions

As previously noted, portions of the models and assumptions used in the Risk Assessment to calculate exposure point considerations are not characteristic of current site conditions. They reflect conditions prior to the removal and investigation done in 1989 and 1990. Other assumptions used are standard to all risk assessments and are still applicable to current site conditions. This section describes models and assumptions used, and indicates which are applicable to pre- and post- removal action scenarios. For complete details of exposure assessment and risk characterization results see Sections 3.4 and 3.5 of the Risk Assessment document.

1. Modeling Concepts

The Linkage Model, in conjunction with the Organic Leachate Model (OLM) and the Vertical and Horizontal Spreading (VHS) Model were used in the Risk Assessment to predict groundwater contaminant concentrations at a hypothetical receptor on Spicer Road, which forms the downgradient boundary of the site. Worst-case and realistic-case dose estimates were generated using measured waste concentrations, modeled leachate concentrations, an unsaturated and saturated zone linkage model, and an EPA-approved groundwater transport model. In addition to the modeled leachate concentrations, existing groundwater contaminant concentrations in the identified plume were also used to estimate risks at the same receptors.

Modeling for exposure to soils contamination was assessed using both worst-case and plausible-case scenarios for the hypothetical cases of contact through trespass and inhalation of contaminated air or fugitive dust.

2. Contaminant Concentrations

The OLM in conjunction with the VHS Model was used to estimate the contaminant concentration in the groundwater due to leaching through the soil. From there, the leachate concentration of a particular contaminant was derived using a linkage model. This model is a one-dimensional screening tool that does not account for contaminant density, co-solvent transport, or colloidal transport. The model assumes that the source of contamination is steady (i.e., not a pulse input such as a single spill) and that contaminant movement occurs only in the vertical direction in the unsaturated zone and only in the horizontal direction in the saturated zone. Upon calculating a contaminant concentration in the saturated zone, a concentration at a selected receptor (in this case, a hypothetical, shallow domestic well installed near Spicer Road, the downgradient boundary of the site, can be estimated. The model mathematically simulates the migration of contaminated groundwater to a point of exposure. The contaminant

concentrations calculated for the site, based on the leaching of contaminants through the soil to the groundwater (as described above), and used to derive risk, are not necessarily characteristic of the current Rasmussen site conditions since the concentrated wastes in the NEBD, IW and TML areas have been removed.

In order to protect human health and the environment, under CERCLA and the NCP, cleanup levels have been established for the site. Given the close proximity of residential wells and the potential future use of the groundwater, risk-based cleanup levels have been established for groundwater. These cleanup levels were used to determine the need for remediation of the existing groundwater contamination. These cleanup levels are consistent with "Type B" cleanup criteria in Michigan Act 307. Michigan Act 307 cleanup criteria are discussed further below.

Cleanup levels have also been established, under CERCLA and the NCP, for the contaminated soil areas at the site. The objective for the soil remediation is to reduce the contaminant levels in the soils to that level which will not leach contaminants above the groundwater cleanup levels. As such, the cleanup levels set for groundwater also provide the basis for the soil remediation. These cleanup levels are also consistent with the cleanup criteria in Michigan Act 307 (R299.5711(2)) which is discussed further below.

For soils, the direct contact scenario used maximum and average source concentrations for the worst-case and plausible-case scenarios. These concentrations were moderated by factors for adsorption and soil adherence.

Worst-case scenarios for air use maximum contaminant concentrations, with a soil disturbance frequency of 30 days per month and zero vegetative cover, while the plausible-case scenario uses the arithmetic average of soil concentrations, with a disturbance frequency of 10 days per month and a 50 percent vegetative cover.

3. Dose and Exposure Scenarios

Dose is used in the modeling of risk and is defined as the amount of a compound, in milligrams (mg), absorbed daily, by a receptor, per kilogram (kg) of body weight. Doses can be calculated for a lifetime (for carcinogenic effects) or for one-time acute exposures (for noncarcinogenic effects).

The factors which influenced groundwater ingestion dose are contaminant concentration (maximum or average), ingestion rate, the fraction of contaminant absorbed, and body weight. The groundwater ingestion rate used for this site was based on the standards of 2 liters/day for a 70-kg adult receptor and the

absorption fraction was 100 percent (1.0) for all groundwater contaminants.

Groundwater inhalation dose considers the following factors: volatile generation rate, inhalation rate, body weight, air exchange rate, shower duration, and total duration in bathroom. The inhalation rate used was 20 liters/min_1 for a 70-kg receptor, and the air exchange rate was 8.3E-03 min^{-1}. The shower duration and total exposure duration were set at 15 minutes and 20 minutes, respectively.

The assumptions used in the groundwater dose calculations are standard and applicable to current site conditions.

Doses for the dermal adsorption route of exposure are calculated using contaminant concentration, area of skin exposed, fraction of contaminant adsorbed, soil adherence per unit area, exposure duration, and body weight. Receptor body weights used were either 50 kg for youths or 70kg for adults. Worst-case estimates employed a 30-day exposure period for 40 years and the plausible-case scenario was calculated using 10 days for 40 years. Exposure duration over a lifetime is a factor in calculating doses and risks from carcinogenic exposure. Noncarcinogenic exposure uses a comparison between maximum daily dose and the applicable health standard.

Conservative assumptions used in modeling dose from the inhalation of emissions from source areas included use of on-site contaminant concentrations to represent downwind concentrations. Calculations of these doses also factored in inhalation rates, fraction of contaminant adsorbed, exposure duration, and the receptor's body weight. Inhalation rate was set at 20 cubic meters per day, and it is assumed that 100 percent of the volatile compounds and only 20 percent of the inorganic compounds is adsorbed. Both maximum and arithmetic average soil concentrations were used to generate worst-case and plausible case exposure scenarios, respectively.

The estimates made for the exposure scenarios are the best representation of the site conditions at the time of the Remedial Investigation.

Toxicity Assessment

The toxicological evaluation characterizes the inherent toxicity of the chemicals. It consists of a review of scientific data to determine the nature and extent of the human health and environmental hazards associated with exposure to the various chemicals. Subsections A. and B. immediately below discuss the concepts of cancer potency factors (CPFs) and reference doses (RfDs) as they are typically employed in the risk assessment process. A site-specific discussion of contaminant toxicity and

the applicable Appendices is included in the "Risk Characterization" section below (subsections B. and C.).

A. Cancer Potency Factors

Cancer potency factors have been developed by EPA's Carcinogenic Assessment Group, for estimating the lifetime probability of human receptors contracting cancer as a result of exposure to known or suspected carcinogens present in site media. Cancer potency factors are derived from the results of human epidemiological studies or chronic animal bioassays, to which animal-to-human extrapolation and uncertainty factors have been applied. CPFs are expressed in units of $(mg/kg\text{-}day)^{-1}$. CPFs are multiplied by the estimated intake of a potential carcinogen, in mg/kg-day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper bound" reflects the conservative estimate of the risks calculated from the CPF. The use of CPFs is in accordance with U.S. EPA's guidance for establishing carcinogenic risk.

B. Reference Doses

Reference doses have been developed by EPA (and MDNR in the case of 0.0004 mg/kg-day for lead) for indicating the potential for adverse health effects from chronic and or sub-chronic human exposure to chemicals exhibiting noncarcinogenic effects. RfDs, expressed in units of mg/kg-day, are estimates of lifetime daily chemical exposure levels for humans, including sensitive individuals, that are likely to be without an appreciable risk of adverse noncarcinogenic health effects. RfDs are derived from human epidemiological studies or animal studies, to which uncertainty factors have been applied, to account for the use of animal data to predict effects on humans. These uncertainty factors help ensure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects to occur. Estimated intakes of chemicals from environmental media (e.g., the amount of a chemical ingested from contaminated drinking water) can be compared to the RfD.

Risk Characterization

The following section describes the process used in the Risk Assessment to estimate the potential incidence of adverse health or environmental effects under the exposure scenarios defined in the above section.

A. Uncertainty in Risk Assessment

Carcinogenic and noncarcinogenic health risks are estimated using a number of different assumptions. The extent to which health risks can be characterized is primarily dependent upon the

accuracy with which a chemical's toxicity can be estimated and the accuracy of the exposure estimates. The toxicological data that form the basis for all risk assessments contain uncertainty in the following areas:

* The extrapolation of non-threshold (carcinogenic) effects from the high doses administered to laboratory animals to the low doses received under more common exposure scenarios.

* The extrapolation of the results of laboratory animal studies to human or environmental receptors.

* The inter-species variation in toxicological endpoints used in characterizing potential health effects resulting from exposure to a chemical.

* The variations in sensitivity among individuals of any species.

Exposure estimates presented for groundwater are based on a number of simplifying assumptions, including the following:

* A contaminant is leached from soil and waste materials according to the relationship between its environmental concentration and its solubility, as defined by the Organic Leaching Model.

* Solubilized contaminants are transported along with the normal groundwater flow. They reach a receptor at any defined distance from the source at a concentration proportional to the source concentration, as defined by the VHS Model.

* Physical and chemical characteristics of site soils and groundwater such as retardation, solubilities, partitioning coefficients, and colloidal effects, are not necessarily considered.

* Receptor characteristics, such as age, body weight and exposure duration, are based on published values, with some attempt at making them more site-specific (eg. known duration of site use by ORVers).

For soils the main simplifying assumption for assessment of risk is that contaminants are transported along with air currents or as particulates, with wind direction and velocity, and are not dispersed en route to the receptor.

For all exposure scenarios and all media, the chemical analytical data base is limited by sample locations and sample frequency. Every effort is made to collect samples that reflect actual site conditions, but not every portion of the site can be sampled.

The following sections on carcinogenic and noncarcinogenic risk are provided as a description of how risk is characterized, and the Rasmussen Risk Assessment numbers generated prior to the removal and sampling of 1989 and 1990 are used as examples. It should be noted that the receptor concentrations used in the assessment are based on the leaching of chemicals from wastes prior to them being removed from the site in 1989/1990. The chemicals of concern noted in the Risk Assessment and Feasibility Study were based on conditions prior to the 1989/1990 removal. The groundwater chemicals of concern listed in Table 1 are for contaminants found in the groundwater at concentrations above health-based levels or taste and odor considerations (discussed further on), that currently exist at the site.

B. Carcinogenic Risks

Carcinogenic risks can be estimated by combining information in the dose-response assessment (carcinogenic potency factors) with an estimate of the individual intakes (doses) of a contaminant by a receptor. The resulting number (risk) is an expression of an individual's likelihood of developing cancer as a result of exposure to the carcinogenic indicator chemicals. This likelihood is in addition to the risks incurred by everyday activities. For example, a risk of 1E-06 is applied to a given population, to determine the number of excess cases of cancer that could be expected to result from exposure. The figure of 1E-06 is one additional case of cancer in 1,000,000 exposed persons.

For purposes of the groundwater risk evaluation, the Agencies considered a hypothetical shallow aquifer residential well, installed at the Spicer Road property boundary. The movement of contamination with the groundwater was modeled under several scenarios. The four scenarios presented in the Risk Assessment included using both the maximum and arithmetic average subsurface soil source concentrations, each with 1 meter and 10 meter values of transverse dispersivity (lateral movement) in order to present a range of potential risk. The total predicted carcinogenic risks (includes both an ingestion and inhalation component) from potential routine use of contaminated groundwater generated on-site for the four scenarios are listed in Table 3-6 of the Risk Assessment attached as Appendix 5 to this ROD. The Rasmussen groundwater plume as well as the four soils areas are included. Tables 3-7 and 3-9 of Appendix 5 show the carcinogenic risk from the soils areas as they pertain to the exposure scenarios of dermal contact and inhalation of fugitive dust.

TABLE 1 - CARCINOGENIC RISK AND GROUNDWATER CLEANUP LEVELS FOR THE RASMUSSEN SITE

CHEMICAL	MAX. CONC. FOUND (ppb)	CARC. RISK w/ MAX CONC.	CLEANUP LEVEL (ppb)	BASIS	CARC. RISK w/ CLEANUP LEVEL
acetone	26,000.0		700.0	HLSC	
benzene	700.0	5.8E-04	1.2	1E-06	1.0E-06
bis(2-ethylhexyl)phthalate	12.0	4.8E-06	2.0	1E-06	1.0E-06
2-butanone	74,000.0		350.0	HLSC	
cadmium	29.0		4.0	HLSC*	
chlorobenzene	3,700.0		50.0	T&O	
2-chlorophenol	17.0		5.0	T&O	
1,1-dichloroethene	2.0	3.4E-05	1.0	MDL	1.7E-05
1,2-dichloroethene	590.0		100.0	HLSC	
ethylbenzene	2,400.0		30.0	T&O	
isophorone	440.0	4.1E-05	8.0	1E-06	1.0E-06
lead	779.0		5.0	HLSC*	
2-methyphenol	1,600.0		300.0	T&O	
4-methyl-2-pentanone	30,000.0		350.0	HLSC	
methylene chloride	1,100.0	2.2E-04	5.0	1E-06	1.0E-06
toluene	71,000.0		40.0	T&O	
1,1,1-trichloroethane	500.0		200.0	MCL	
trichloroethene	774.0	2.3E-04	3.0	1E-06	1.0E-06
vinyl chloride	96.0	6.2E-03	1.0	MDL	7.0E-05
xylenes	11,000.0		20.0	T&O	

TOTAL CARCINOGENIC RISK FROM CONTAMINANTS CURRENTLY IN GROUNDWATER = 7.3E-03

TOTAL CARCINOGENIC RISK FROM CONTAMINANTS AT CLEANUP LEVELS = 9.2E-05

Key to Basis of Cleanup Levels

MDL = Method Detection Limit
MCL = Maximum Contaminant Level
1E-06 = One in One Million Carcinogenic Risk Level
T & O = Taste and Odor Threshold
HLSC = Human Lifecycle Safe Concentration
HLSC* = HLSC or Filtered Background (whichever is higher)

The carcinogenic risks associated with the maximum groundwater concentrations are listed in Table 1 of this ROD.

Major contributing chemicals to the carcinogenic risks from dermal contact with site soils are as follows: PCBs and benzo(a)pyrene for the TML; PCBs for the IW; PCBs for the PDSLD; and dioxins for the NEBD. As noted previously, the drummed wastes and associated contaminated soils have now been removed from the IW, NEBD and TML areas of concern. Remediation of these soils areas is, however, necessary for mitigation of the potential risk posed by the contaminated soils areas to groundwater, as noted in Table 3-6 of Appendix 5.

The 1989/1990 supplemental soils investigation, included as Appendix 3, showed the presence of contaminated soils in the PDSLD which are a current source of groundwater contamination. These findings provided more detail with regard to the threat posed by the PDSLD soils.

Even under the worst-case scenario, the risks from potential fugitive dust emissions do not exceed 1.56E-07. This is shown in Table 3-9 of Appendix 5. Potential inhalation of ambient air from the combination of the Spiegelberg and Rasmussen sites prior to the 1989/1990 source control removal activities, in the worst-case scenario, produces a total carcinogenic risk of 4.1E-06. An explanation of inhalation risk calculation can be found above in the section entitled "Dose and Exposure Scenarios".

c. Noncarcinogenic Risk

Potential health risks resulting from exposure to noncarcinogenic compounds are estimated by dividing the maximum daily dose exposure by the Reference Dose (RfD), to obtain the Hazard Index. If the Hazard Index exceeds one, there is a potential health risk associated with exposure to that particular chemical. The Hazard Index is not a prediction of the severity of toxic effects, but simply a numerical indicator of the transition from an acceptable to unacceptable levels. The total Hazard Index for an exposure route is the sum of all Hazard Indices for each individual chemical. Hazard Indices were determined for the existing Rasmussen groundwater plume as noted in the Risk Assessment Table 3-11 and included in Appendix 6 here. Hazard Indices were greater than one for the groundwater plume itself, and for worst-case scenario for the NEBD in the pre-removal hazard assessment. The Hazard Index Tables for the direct dermal contact and the fugitive dust emissions scenarios are included in Risk Assessment Tables 3-12 and 3-14, and attached as Appendix 6 here. None of the direct dermal contact or fugitive dust emission Indices exceeded one.

Environmental Risk

Over and above its utilitarian value to humans as a usable aquifer, the groundwater is a resource to be evaluated as are all other environmental compartments and life forms. Based on the findings of the Remedial Investigation, a portion of the on-site groundwater at the Rasmussen site has been degraded and poses the potential for degrading more of the downgradient resource, if not remediated. The prevention of further degradation of the presently contaminated groundwater resource is an environmental remedial objective that needs to be addressed by any remedy chosen for the Rasmussen site.

Also evaluated for environmental risk from groundwater contamination were air, soil, surface waters, and terrestrial and aquatic biota. None of these potential environmental receptors were determined to be at risk from the Rasmussen site.

Based on reports of citizen's complaints early in the Rasmussen site's history, burning wastes and reports of odors may have been indicative of air releases at that time. Through recent sampling efforts, air releases have not been found to pose a risk at the Rasmussen site.

No hydrologic connection was found to exist between the site's source areas and the area's surface waters. The Huron River is about a mile and one half north of the contaminated portion of the site. The Spiegelberg peat pond to the south and several low areas to the north and east are the only surface water features located near the site. Assessment of these features showed them to be uncontaminated, and not hydrologically connected to the waste areas on the site.

One threatened species, the Eastern Sand Darter (Ammocrypta pellucida) (a member of the perch family), and one special concern species, the Dwarf Hackberry (Celtis tennifolia), were identified as inhabiting environs near the site. Although terrestrial flora and fauna which live within or traverse the site may come in contact with contaminated surface soils, environmental toxicologists have noted that if contamination is addressed to protect for human health, potential risks to wildlife would be addressed as well.

No critical habitats have been threatened by the contamination at the Rasmussen Site.

Chemicals of Concern and Cleanup Levels

Chemicals of concern were determined for the Rasmussen groundwater plume. The basis for the selection of the 20 chemicals of concern (noted in Table 1), are those detected at levels in Remedial Investigation sample data, and which pose a

potential risk to human health and the environment. The Chemicals of Concern pose a potential risk by either exceeding the level for the 1E-06 carcinogenic risk, by exceeding the level for Human Lifecycle Safe Concentrations (HLSCs), or by exceeding an aesthetics level. The basis for the selection of these cleanup levels is provided in CERCLA Section 121 and the NCP. In order to protect human health and the environment, under CERCLA and the NCP, risk-based cleanup levels have been established for groundwater. A risk-based cleanup is necessary due to the close proximity of residential wells and the potential future use of groundwater at and near the site. These cleanup levels are consistent with "Type B" cleanup criteria in Michigan Act 307 and the Michigan Act 307 Rules (R299.5705, 707, 709, 717).

The chemicals which have cleanup levels based on the 1E-06 carcinogenic risk for the existing groundwater plume are: benzene, bis(2-ethylhexyl)phthalate, isophorone, methylene chloride, and trichloroethene. These chemicals are known to cause cancer in laboratory animals, and thus are classified as carcinogens.

Two carcinogens, 1,1-dichloroethene and vinyl chloride have carcinogenic risk levels which are lower than what can be detected by current laboratory methodologies. These chemicals have cleanup levels set by their respective method detection limits (MDLs).

A second group of chemicals of concern at this site are classified as noncarcinogens and are believed to exert their toxicity by a threshold mechanism of action. The HLSCs, which were developed for the noncarcinogens, are based on this concept. The HLSCs represent the highest groundwater concentration to which a human can be exposed continuously, for a lifetime, without exhibiting any observable adverse health effects. Cleanup levels for six chemicals were set in this manner: acetone, 2-butanone, cadmium, lead, trans-1,2-dichloroethene, and 4-methyl-2-pentanone.

Unfiltered samples analyzed during the RI were found to exceed the HLSC calculated for lead and cadmium. There may be reason to believe that dissolved levels of lead and cadmium will not exceed background dissolved concentrations. Therefore, the HLSC groundwater cleanup level noted in Table 1 is starred (*). This indicates that a determination will be made as a result of design studies. If 1) filtered lead and cadmium samples are less than 5.0 ppb and 4.0 ppb, respectively; or if 2) on-site filtered lead and cadmium samples are greater than 5.0 and 4.0 ppb, respectively, and on-site filtered lead and cadmium levels are equal to or than their corresponding filtered background samples, then cleanup for these chemicals of concern will not be required.

Where insufficient data exist to calculate HLSCs for noncarcinogens, or where aesthetic data indicate that the chemical can still be detected either by taste or smell at the HLSC level, the literature-derived Taste and Odor (T&O) threshold is used as the cleanup level. The cleanup levels for chlorobenzene, ethylbenzene, 2-methylphenol, toluene, and xylenes are based on taste and odor thresholds.

One noncarcinogen, 2-chlorophenol, has a taste and odor threshold below what can be reliably detected. Therefore, the cleanup level for 2-chlorophenol is set at the MDL.

Summary of Risks

Although no individuals are directly ingesting contaminated groundwater from the Rasmussen site, the contamination could pose a health risk to potential receptors in the future. A significant amount of contaminated groundwater currently remains on site and is expected to continue to migrate towards downgradient wells, thereby creating potential exposure routes for human receptors. The future possibility exists, as well, for groundwater use at the site. In order to protect public health and the environment, remediation of the groundwater resource is necessary. The NEBD, TML, and IW soils areas of concern pose potential risks to the groundwater resource, while the PDSLD area poses a current risk to the groundwater. Remediation of these four soils areas is necessitated by the risks posed to groundwater.

Potential risks from direct dermal contact or from inhalation of airborne contaminants, when modeled, do not pose significant risk to human health.

Actual or threatened releases of hazardous substances from the Rasmussen site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

Description of Alternatives

Alternatives Screening Process

Initially, the Feasibility Study considered all potential alternatives for remediation of the Rasmussen site. Subsequent preliminary and detailed screening left only a limited number of alternatives, in part due to ARARs which restricted remedial options because of waste types and concentrations present.

The reader is directed to Tables 6-6, 6-7, 6-8 and 6-9 in Volume III (and associated text in Chapter 6) of the Feasibility Study Report, for the detailed screening of the PDSLD, IW, NEBD, and

TML soils areas, respectively. The alternatives remaining after detailed screening of the TML soils area of concern were clay and multi-media capping, and on-site incineration. The detailed screening of alternatives for the Rasmussen groundwater plume area of concern is described in Chapter 7 of the Feasibility Study Report and is supported by Tables 7-1, 7-3, and 7-4 in that report.

In the subsequent evaluation of incineration versus capping, cost and dioxin disposal were the two major considerations. The large volume and the variability of the waste contained in the dump make incineration an extremely costly (over $100 million) option. Dioxins were found in the TML, but on average were below 1.0 ppb, the level which may trigger further action (Kimbrough et.al., 1984). However, the presence of dioxins increases the short-term inhalation risk to workers and community for alternatives which involve excavation (due to fugitive dust emissions). The implementability of the off-site disposal option is limited at best, as no landfills in the United States accept dioxin-containing wastes and no vendors were found to treat this waste type.

Since liquids and other concentrated industrial wastes have been removed from the NEBD, IW and TML by EPA and the PRPs, the capping alternative is enhanced.

U.S. EPA guidance provides for the combination of medium-specific alternatives during the detailed analysis phase of remedy selection. If comprehensive options are found to address all potential site threats, then the Agency may propose site-wide remedial alternatives. Remedy selection in the Feasibility Study anticipated completion of the removal actions, and the site-wide alternative was proposed as a remedy. Chapters 8 and 9 of the Feasibility Study describe the transition from the comprehensive list of alternatives to the site-wide alternatives.

As part of the combination of alternatives, the process options evaluated in the detailed screening of alternatives for the Rasmussen groundwater were combined to develop a site-wide action alternative for the contaminant plume. Page 8-5 of Volume I of the Feasibility Study describes the combination of groundwater remedial alternatives.

Subsequent to the completion of the Feasibility Study, a supplemental soils investigation in the PDSLD, completed in early 1990, provided additional information as to the nature and extent of the contamination in this area and led to differing conclusions with regard to the preferred alternative. The Remedial Investigation led the Agencies to conclude that soils, particularly in silty lenses throughout the unsaturated zone in the PDSLD, were contaminated with PCBs and other organic contaminants. Based on these facts, remedy selection efforts

were focused on actions which would prevent the contaminants, shown to be in the intervening PDSLD layers, from migrating to the groundwater, while providing a level of protectiveness for the other three soils areas of concern. Excavation and capping options were explored along with the non-excavation and capping options. The accompanying groundwater remedy included re-injection of treated groundwater via recharge wells rather than seepage basin reintroduction, due to the lack of space remaining if the soils capping remedies were implemented. Recharge wells were found to be less costly than seepage basins, when used purely for the reintroduction of treated water.
The 1989/1990 supplemental soils investigation of the PDSLD showed that the following conditions exist in this area:

* The unauthorized sand and gravel mining from this area in 1987 had taken with it some contaminants from the unsaturated soils.

* No PCBs were determined to exist at depth in the PDSLD.

* PCBs were not found in the PDSLD soils at concentrations significantly exceeding 1 ppm.

* Contaminants such as chlorobenzene, ethylbenzene, toluene, xylenes, 1,2-dichlorobenzene, and 1,3-dichlorobenzene were found to be within the 25-foot zone above the water table in the PDSLD. Contaminant levels were highest at or near the water table.

* Contaminants such as 1,1,1-trichloroethane and tetrachloroethene were distributed throughout the soil in the PDSLD, but in concentrations below health-based risk levels.

Although capping options were retained for the soils areas of concern as the best overall option and groundwater purge and treat was retained for treatment of the groundwater plume, modifications were made to tailor the options based on the new information. Modifications include:

* The cap would not be effective in containing the remaining contamination in the IW and PDSLD areas since it is concentrated in the soil profile just above the water table, and would continue to be a source of contamination to the groundwater as the water table fluctuated. Direct contact with the surface soils of the PDSLD and IW areas is no longer a concern, so the cap would not be necessary for those areas. The cap should cover the TML including the NEBD, to prevent further infiltration, and direct contact with contaminants.

- Reintroduction of treated groundwater could now be achieved more cost effectively through seepage basins, since this system, when located above the IW and PDSLD areas, will serve the dual purposes of 1) reintroduction of treated groundwater and 2) flushing of contaminants through the unsaturated zone to the groundwater, and toward the extraction wells. This will create a closed-loop groundwater treatment system.

These considerations resulted in different cost estimates and remedy descriptions in the Proposed Plan than were presented in the Feasibility Study. Capping cost estimates (below) have been modified some since the issuance of the Feasibility Study to more accurately reflect the amount of material required for each cover type and areal extent. The groundwater cost estimate has also changed to include seepage basins instead of injection wells. Cost estimates do not reflect any future drum disposal which may be required. Drum removal will add roughly $1,000 per container to the overall cost of each of these options. However, costs are comparable for all of the capping alternatives.

Design studies show that for all of the capping options considered, the Rasmussen cap will extend onto the Spiegelberg property. This is necessitated by cap design criteria involving slope for drainage and erosion control. Terracing may be designed into the selected alternative to control the overflow onto neighboring properties.

Description of Site-wide Alternatives

The site-wide remedial alternatives described below, were evaluated in the Feasibility Study as Alternatives 1 through 7--with Alternative 1 being the No Action Alternative for the soils areas; Alternatives 2 through 5, variations on the in-place capping alternative; Alternative 6, the No Action Alternative for groundwater; and, Alternative 7, a Treatment Alternative for groundwater. Alternatives 8 and 9 in the Feasibility Study are pertinent to the neighboring Spiegelberg site, and are therefore not addressed in this ROD.

Soils

Site Wide Alternative 1 - NO ACTION.

Under this scenario, no further remedial measures would be taken for the four soils areas of concern to prevent potential exposure to, or migration of the contaminants in the unsaturated zone soils to the groundwater. Risks currently posed by the contaminated groundwater are expected to increase under this No Action scenario. Although the site is currently fenced, the potential for direct contact with contaminated surface soils is not completely eliminated, and the No Action Alternative does

nothing to reduce the potential for direct contact with these soils.

Implementation Time:	None.
Capital Cost:	$ 0
Annual Operation and Maintenance (O&M):	$ 0
Total Costs w/ 1 Year O&M:	$ 0

Site Wide Alternative 2 - Clay cap with no further excavation and restricted access.

Under this alternative, a Michigan Act 64 cap with a 3-foot thick clay layer, a minimum of one-foot thick drainage layer and a one-foot thick vegetated soil layer would be constructed over the combined TML and NEBD areas of concern. The IW and PDSLD areas need not be covered, but may be partially covered in order to provide adequate north-face slopes for the two capped areas. Access restrictions, such as fencing, would be placed around the capped soil areas. Deed restrictions would be instituted to prevent future land use. Drums which are currently visible, or which are unearthed during cap implementation, will be disposed of in accordance with applicable Federal and State regulations.

Implementation Time:	1 to 2 years.
Capital Cost:	$ 2,940,247
Annual Operation and Maintenance (O&M):	$ 53,043
Total Costs w/ 1 Year O&M:	$ 2,993,290

Site Wide Alternative 3 - Clay cap with further excavation and restricted access.

Under this alternative, the PDSLD area would be excavated and consolidated alongside the north face of the dump. A clay cap (as described in Alternative 2) would then be constructed over the consolidated areas. Access restrictions, such as fencing would be placed around the capped soil areas. Deed restrictions would be instituted to prevent future land uses. Drums which are currently visible, or which are unearthed during cap implementation, will be disposed of in accordance with applicable Federal and State regulations.

Implementation Time:	1 to 2 years.
Capital Cost:	$ 4,486,019
Annual Operation and Maintenance (O&M):	$ 53,043
Total Costs w/ 1 Year O&M:	$ 4,539,062

Site Wide Alternative 4 - Multi-media cap with no further excavation and restricted access.

Under this alternative, a multi-media RCRA-type cap with 1) a 12-inch thick vegetated soil layer on top, 2) a 12-inch thick drainage layer, 3) a synthetic liner at least 20 milliliters

thick, and 4) a 2-foot thick layer of compacted clay with a permeability of 1E-07 cm/sec or less would be constructed over the TML and NEBD areas of concern as they now exist spatially on-site. Access restrictions, such as fencing, would be placed around the capped soil areas. Institutional controls, such as deed restrictions, would be instituted to prevent future land uses. Drums which are currently visible, or which are unearthed during cap implementation, will be disposed of in accordance with applicable Federal and State regulations.

Implementation Time:	1 to 2 years.
Capital Cost:	$ 4,946,285
Annual Operation and Maintenance (O&M):	$ 200,000
Total Costs w/ 1 Year O&M:	$ 5,146,285

Site Wide Alternative 5 - Multi-media cap with further excavation and restricted access.

Under this alternative, the PDSLD area would be excavated and consolidated alongside the north face of the landfill. A multi-media RCRA-type cap with 1) a 12-inch thick vegetated soil layer on top, 2) a 12-inch thick drainage layer, 3) a synthetic liner at least 20 milliliters thick, and 4) a 2-foot thick layer of compacted clay with a permeability of 1E-07 cm/sec or less would be constructed over the consolidated areas of concern as they now exist spatially on-site. Access restrictions, such as fencing, would be placed around the capped soil areas. Institutional controls, such as deed restrictions, would be instituted to prevent future intrusive land uses. Drums which are currently visible, or which are unearthed during cap implementation, will be disposed of in accordance with applicable Federal and state regulations.

Implementation Time:	1 to 2 years.
Capital Cost:	$ 6,491,669
Annual Operation and Maintenance (O&M):	$ 200,000
Total Costs w/ 1 Year O&M:	$ 6,691,669

Additional Notes on Capping Options

Alternatives 4 and 5 (multi-media caps) reduce surface water infiltration by 99 percent, while Alternatives 2 and 3 (clay caps) reduce infiltration by 95 percent.

The cost estimates for alternatives 2, 3, 4, and 5 do not include removal of drummed wastes which may be encountered during excavation. Drum removal will add on roughly $1,000 per container to the overall cost of each of these options.

Groundwater

Site Wide Alternative 6 - NO ACTION.

Under this alternative, no further remedial measures would be taken to remediate the groundwater. Current groundwater contamination would not be addressed, the contaminants would potentially migrate off-site, and pose an endangerment to public health and the environment.

Implementation Time:	None.
Capital Cost:	$ 0.
Annual Operation and Maintenance (O&M):	$ 0
Total Costs w/ 1 Year O&M:	$ 0

Site Wide Alternative 7 - Treatment

This groundwater treatment alternative includes:

- extraction of groundwater to capture and halt the flow of the plumes.
- removal of heavy metal contaminants by chemical precipitation followed by pH adjustment (if necessary).
- removal of several organic contaminants, including ketones, by a biological treatment system.
- removal of residual organic contaminants via air stripping.
- further removal of residual organic contaminants via granular activated carbon (GAC) (or other carbon adsorption methodology, if necessary).
- discharge of treated water to the groundwater via a seepage basin situated over the IW and PDSLD soils areas of concern.
- groundwater monitoring through a system of wells to assess the effectiveness of the system at:
  - halting the migration of contamination.
  - reducing the levels of contamination in the soils and groundwater, over time.
- a process effluent sampling program to aid in determining the effectiveness of the remedy.
- fencing and deed restrictions, as necessary, to ensure the integrity of the remedy.
- Residential well sampling will be continued, in conjunction with that called for in the final remedial actions at the neighboring Spiegelberg Superfund Site.

The final processes to be installed for groundwater cleanup will be determined by treatability studies during design.

Since contamination has been confirmed in the location of groundwater monitoring well RA-MW-27, groundwater will need to be purged from this location and will need to be manifolded into the treatment system feed supply line for treatment prior to discharge.

Implementation Time:	Minimum of 5 years.
Capital Cost:	$ 2,740,000
Annual Operation and Maintenance (O&M):	$ 4,580,000
Total Costs w/ 1 Year O&M:	$ 7,320,000

This groundwater treatment alternative would initially cost roughly $150,000 less if injection wells were used rather than a seepage basin for re-introduction of treated groundwater.

The reinjected water from the treatment system will not contain contaminant levels in excess of the levels specified in Table 1, and the system will be designed as a "closed loop" so that contaminated groundwater will not migrate off-site. The ultimate goal of this treatment option is to reduce groundwater contaminant levels to that which are protective of public health and the environment, based on the potential for groundwater use at the site. The goal of flushing for the PDSLD/IW soils is to reduce contaminant levels to that which will not continue to adversely impact the groundwater resource. This is discussed further on in the sections entitled "Attainment of Goals" and "Compliance Points".

Treatment system sludges generated on site will be tested to verify their characteristic nature and properties in order to determine if they are subject to the RCRA Subtitle C requirements, including the Land Disposal Restrictions (LDRs), or other pertinent regulations. Those sludges which are not subject to the RCRA requirements will be disposed of on-site, or at a landfill meeting applicable Federal and State regulations. Those sludges identified as RCRA hazardous wastes, will be processed to ensure compliance with LDR treatment standards, prior to disposal at a RCRA licensed landfill. The activated carbon will be regenerated off site at a permitted facility. A monitoring system designed to verify capture of the contaminant plume will be implemented, and will include monitoring of residential wells in the area.

Summary of Comparative Analysis of the Remedial Alternatives

The following nine criteria, outlined in the NCP at Section 300.430(e)(9)(iii), were used to compare the alternatives and to determine the most appropriate alternative for remediation of the soils and groundwater that is protective of human health and the environment, attains applicable or relevant and appropriate requirements (ARARs), is cost-effective and represents the best balance among the evaluating criteria. The paragraph(s) following each criterion detail how the alternatives meet or fail to meet, that criterion. This comparison of alternatives considers the "action" options for soils and for groundwater as complete site-wide alternatives, particularly as they pertain to Alternatives 2 and 4. For these two alternatives, the soils action is interdependent with the groundwater seepage basin

alternative. For Alternatives 3 and 5, which include excavation and consolidation of waste areas, the groundwater Alternative 7 would include the less-costly reinjection well process option.

1. Overall Protection of Human Health and the Environment addresses whether or not a remedy provides adequate protection and describes how risks are eliminated, reduced or controlled through treatment, engineering controls or institutional controls.

All of the site-wide alternatives considered for the soils areas, with the exception of the No Action Alternative, provide adequate protection by reducing risk to human health and the environment by capping soils available for dermal contact, and by limiting the potential for further contaminant migration, via infiltration, to the groundwater. Alternatives 4 and 5, multi-media caps, offer greater reduction of surface water infiltration than do Alternatives 2 and 3, the clay caps. Short term risks associated with Alternatives 2, 3, 4 and 5 are primarily due to dust from construction activities. A health and safety program which includes worker protection and dust suppression will reduce these risks.

Alternatives 3 and 5 include further excavation of the PDSLD soils and consolidate these soils within the site unit. The combination of the non-excavation soils alternatives (2 and 4) and a groundwater remedy with seepage basins remove contaminants with minimal disturbance, as compared to the excavation options.

Although Alternative 4 with Alternative 7 achieves the greatest overall level of protection of the alternatives being considered, Alternative 2 with Alternative 7 is also adequately protective. Implementation of either of these remedies would greatly reduce the present and potential future exposure risks by: removing contaminated source material through the groundwater purge system; decreasing surface water infiltration in the capped areas (inhibiting contaminant mobility); and limiting potential dermal and inhalation exposures to contaminated surface soils.

The soils No Action Alternative 1 does nothing to prevent further contamination of groundwater, or prevent dermal contact exposure from residual contamination. The No Action Alternative 6 would not provide protection from existing and potential future risks to the groundwater.

2. Compliance with ARARs addresses how the proposed alternative complies with all applicable or relevant and appropriate requirements of Federal and more stringent State environmental laws (ARARs) and also considers how alternatives comply with advisories or other guidance that do not have the status of laws, but that the U.S. EPA and the State have agreed should be considered for

protectiveness, or to carry out certain actions or requirements.

A summary of identified ARARs for the soils and groundwater alternatives are presented in Tables 2 and 3, respectively. All potential ARARs are included in the Tables, which indicates which ARARs are now Applicable or Relevant and Appropriate. The key following the tables indicates whether the ARAR is chemical-specific (C), location-specific (L), and/or action-specific (A). As discussed in detail further on in this ROD, the selected combination of remedies will attain all pertinent ARARs. These tables list only those identified ARARs necessary for onsite remedial activities. In some instances, the rules cited contain both substantive and procedural or administrative requirements. Only the substantive requirements are ARARs for the purpose of on-site activities. Examples of administrative or procedural requirements which are not considered ARARs include, but are not limited to, reporting requirements and permit application requirements.

The No Action alternative does not comply with all requirements of the identified ARARs for the contaminated groundwater plume. The majority of the remaining potential ARARs identified are not applicable, relevant or appropriate to the groundwater No Action Alternative. Adoption of this alternative would not prevent further migration of contaminated groundwater.

Both the Federal and State Safe Drinking Water Acts are not applicable (the aquifer under the site is not used for a community or non-community public water supply) to the Rasmussen groundwater considerations, but are relevant and appropriate since they regulate Maximum Contaminant Levels in drinking water for protection of human health. The aquifer of concern here is the source of drinking water for the area. Table 11-2 and Chapters 11.1.3 and 11.2.3 in Volume II of the Feasibility Study address ARARs for the Rasmussen groundwater Alternatives. Alternative 7 will attain ARARs specific to individual component actions (i.e., chemical precipitation, biological treatment, air stripping, and carbon adsorption).

Alternatives 2, 3, 4, and 5 for soils will meet Federal and State ARARs, while the No Action Alternative does not comply with any of the identified ARARs for the soils areas. Both the multi-media and Michigan Act 64 clay caps comply with the requirements found in the Resource Conservation Recovery Act at 40 CFR Part 264 et.seq. Please refer to Sections 9.1.3, 9.2.3, 9.3.3, 9.4.3, 9.5.3 of Volume II of the Feasibility Study, and Table 9-2 in Volume III of the Feasibility Study, for discussions of the soils Alternatives and ARARs.

Table 2 - ARARs Summary Site-Wide Alternatives Rasmussen Soils Areas for Alternatives 1,2, and 3			
	ALTERNATIVE 1 NO ACTION ALTERNATIVE	ALTERNATIVE 2 CLAY CAP	ALTERNATIVE 3 EXCAVATION/CLAY CAP
FEDERAL ARARs			
RESOURCE CONSERVATION AND RECOVERY ACT (A and C)			
RCRA 40 CFR 264 Standards for owners and operators of hazardous waste TSD facilities.	Not an ARAR	40CFR 264.310;40CFR 264.116-117 Requirements are not applicable because RCRA hazardous waste was placed at the site prior to the effective dates. Requirements are relevant and appropriate since they regulate circumstances sufficiently similar to the site.	40CFR 264.310;40CFR 264.116-117 Requirements are not applicable because RCRA hazardous waste was placed at the site prior to the effective dates. Requirements are relevant and appropriate since they regulate circumstances sufficiently similar to the site.
CLEAN AIR ACT (A)			
CAA 40 CFR 50 These regulations establish the National Primary and Secondary Ambient Air Quality Standards for sulfur dioxide, particulate matter, carbon monoxide, ozone, nitrogen dioxide, and lead.	40 CFR 50.1-50.12 This requirement is applicable since air contaminants may be emitted.	40 CFR 50.6 Requirement is applicable since construction operations would be subject to the TSP standard (150 ug/m^3 - 24 hour average).	40 CFR 50.6 Requirement is applicable since excavation and construction operations would be subject to the TSP standard (150 ug/m^3 - 24 hour average).
OCCUPATIONAL SAFETY AND HEALTH ACT (A)			
OSHA 29 CFR 1910 Occupational safety and health standards adopted to provide safe or healthful employment.	Not an ARAR	29 CFR 1910.120 Requirement is applicable since cap construction operations would take place at a hazardous waste site designated for cleanup.	29 CFR 1910.120 Requirement is applicable since excavation and construction operations would take place at a hazardous waste site designated for cleanup.

Table 2 – Page 2

	ALTERNATIVE 1 NO ACTION ALTERNATIVE	ALTERNATIVE 2 CLAY CAP	ALTERNATIVE 3 EXCAVATION/CLAY CAP
OCCUPATIONAL SAFETY AND HEALTH ACT (A)			
OSHA 29 CFR 1926 Regulations set forth the safety and health standards for construction and related activities.	Not an ARAR	29 CFR 1926 Requirement is applicable for all on-site construction related activities.	29 CFR 1926 Requirement is applicable for all on-site construction related activities.
STATE ARARs			
HAZARDOUS WASTE MANAGEMENT ACT (A)			
HWMA - ACT 64 Regulations containing standards for generators and transporters of hazardous waste and owners and operators of TSDFs.	Not an ARAR	MAC R299.9619(5);R299.9620(2); R299.9611-9612 Requirements are not applicable because HWMA hazardous waste was placed at the site prior to the effective dates. Requirements are relevant and appropriate since they regulate circumstances sufficiently similar to the site.	MAC R299.9619(5);R299.9620(2); R299.9611-9612 Requirements are not applicable because HWMA hazardous waste was placed at the site prior to the effective dates. Requirements are relevant and appropriate since they regulate circumstances sufficiently similar to the site.
AIR POLLUTION ACT (A)			
APA - ACT 348 Rules containing emissions limitations and prohibitions for particulate matter, fugitive dust, and VOCs.	MAC R336.1901 Requirement is applicable since air contaminants may be emitted.	MAC R336.1371-R336.1373 Requirements are applicable since construction operation at the site are potential sources of fugitive dust.	MAC R336.1371-R336.1373,R336.1901 R336.1301;R336.1331;R336.1702 These requirements are applicable since excavation and construction operations at the site are potential sources of fugitive dust. Excavation operation would be subject to State standards for emissions of VOCs and particulate matter.

Table 2 – Page 3			
	ALTERNATIVE 1 NO ACTION ALTERNATIVE	ALTERNATIVE 2 CLAY CAP	ALTERNATIVE 3 EXCAVATION/CLAY CAP
SOIL EROSION SEDIMENTATION CONTROL ACT (A)			
SESCA – ACT 347 Regulations prescribing the requirements for soil erosion and sedimentation control measures and procedures.	Not an ARAR	MAC R323.1701-R323.1714 Requirements are applicable since construction operations would involve earth changes and the potential for soil erosion.	MAC R323.1701-R323.1714 Requirements are applicable since excavation and construction operations would involve earth changes and the potential for soil erosion.
FROST LAWS (A AND L)			
MCLA – 257.722 Rules governing the reduction of maximum axle loads during the period of March – May.	Not an ARAR	Section 257.722 Requirement is applicable since materials could be transported to the site from March to May.	Section 257.722 Requirement is applicable since materials could be transported to the site from March to May.
MINERAL WELL ACT (A)			
MINERAL WELL ACT 315 Rules describing the permitting requirements for drilling brine, storage, disposal, and test wells.	Not an ARAR	MAC R299.2211-R299.2229 Requirements are applicable since monitoring wells will be installed up and downgradient of the capped area, as part of the groundwater monitoring requirements (R299.9612).	MAC R299.2211-R299.2229 Requirements are applicable since monitoring wells will be installed up and downgradient of the capped area, as part of the groundwater monitoring requirements (R299.9612).
ENDANGERED SPECIES ACT (L)			
ENDANGERED SPECIES ACT Rules contain a listing of the fish, wildlife, and plant species that have been determined to to be endangered or threatened.	Not an ARAR	MAC R299.1021-R299.1028 These requirements are applicable since one threatened species, the Eastern Sand Darter (Ammocrypta pellucida), and one special concern species, the Dwarf Hackberry (Celtis tennifolia), have been reported to occur on or near the site.	MAC R299.1021-R299.1028 These requirements are applicable since one threatened species, the Eastern Sand Darter (Ammocrypta pellucida), and one special concern species, the Dwarf Hackberry (Celtis tennifolia), have been reported to occur on or near the site.

Table 2 - Page 4

	ALTERNATIVE 1 NO ACTION ALTERNATIVE	ALTERNATIVE 2 CLAY CAP	ALTERNATIVE 3 EXCAVATION/CLAY CAP
MICHIGAN WATER RESOURCES COMMISSION ACT (A AND C) ***			
MWRCA - ACT 245 Statute and rules protect groundwater resources from injurious substances and provide for the non-degradation of groundwater.	Section 323.6(1) Requirement is applicable since injurious substances from hazardous waste leachate would continue to migrate toward groundwater.	Section 323.6(1) MAC R323.2201 et. seq. Requirement is applicable because hazardous substances exist in the soils which may discharge to the groundwater. Remedy prevents such discharge.	Section 323.6(1) MAC R323.2201 et. seq. Requirement is applicable because hazardous substances exist in the soils which may discharge to the groundwater. Remedy prevents such discharge.
ENVIRONMENTAL RESPONSE ACT RULES (A AND C)			
ENVIRONMENTAL RESPONSE ACT RULES Rules describe cleanup criteria for response activities.	MAC R299.5601-R299.5727 Parts 6 and 7 of the Act 307 Rules provide that remedial actions be protective of public health, safety, and welfare and the the environment and natural resources, and the attainment of cleanup standards under Type A, B, or C cleanup. Parts 6 and 7 are ARARs for the remedial action.	MAC R299.5601 Parts 6 and 7 of the Act 307 Rules provide that remedial actions be protective of public health, safety, and welfare and the environment and natural resources, and the attainment of cleanup standards under Type A, B, or C cleanup. Parts 6 and 7 are ARARs for the remedial action.	MAC R299.5601 R299.5727 Part 6 and 7 of the Act 307 Rules provide that remedial actions be protective of public health, safety, and welfare and the environment and natural resources, and the attainment of cleanup standards under Type A, B, or C cleanup. Parts 6 and 7 are ARARs for the remedial action.

***The State has identified Michigan Act 245, Part 22 Rules as an applicable ARAR. The United States disagrees that Act 245, as interpreted and applied by the State in this matter, is an ARAR. This issue is the subject of litigation in U.S. v. Akzo Coatings of America, appellate case numbers 89-2902 and 89-2137.

Table 2 - Page 5

	ALTERNATIVE 4 MULTI-MEDIA CAP	ALTERNATIVE 5 EXCAVATION/MULTI-MEDIA CAP
FEDERAL ARARs		
RESOURCE CONSERVATION AND RECOVERY ACT (A and C)		
RCRA 40 CFR 264 Standards for owners and operators of hazardous waste TSD facilities	40 CFR 264.310;40 CFR 264.116-117 Requirements are no applicable because RCRA hazardous waste was placed at the site prior to the effective dates. Requirements are relevant and appropriate since they regulate situations and circumstances.	40 CFR 264.310;40 CFR 264.116-117 Requirements are not applicable because RCRA hazardous waste was placed at the site prior to the effective dates. Requirements are relevant and appropriate since they regulate circumstances sufficiently similar to the site.
CLEAN AIR ACT (A)		
CAA 40 CFR 50 These regulations establish the National Primary and Secondary Ambient Air Quality Standards for sulfur dioxide, particulate matter, carbon monoxide, ozone, nitrogen dioxide, and lead.	40 CFR 50.6 Requirement is applicable since construction operations would be subject to the TSP standard (150 ug/m^3 - 24 hour average).	40 CFR 50.6 Requirement is applicable since excavation and construction operations would be subject to the TSP standard (150 ug/m^3 - 24 hour average).
OCCUPATIONAL SAFETY AND HEALTH ACT (A)		
OSHA 29 CFR 1910 Occupational safety and health standards adopted to provide safe or healthful employment	29 CFR 1910.120 Requirement is applicable since cap construction operation would take place at a hazardous waste site designated for cleanup.	29 CFR 1910.120 Requirement is applicable since excavation and construction operations would take place at a hazardous waste site designated for cleanup.
OSHA 29 CFR 1926 These regulations set forth the safety and health standards for construction and related activities.	29 CFR 1926 Requirement is applicable for all on-site construction related activities.	29 CFR 1926 Requirement is applicable for all on-site construction related activities.

Table 2 - Page 6

	ALTERNATIVE 4 MULTI-MEDIA CAP	ALTERNATIVE 5 EXCAVATION/MULTI-MEDIA CAP
STATE ARARs		
HAZARDOUS WASTE MANAGEMENT ACT ACT (A)		
HWMA - ACT 64 Regulations containing standards for generators and transporters of hazardous waste, and owners and operators of hazardous waste TSDFs.	MAC R299.9619(5);R299.9620(2); Requirements are not applicable because HWMA hazardous waste was placed at the site prior to the effective dates. Requirements are relevant and appropriate since they regulate circumstances sufficiently similar to the site.	MAC R299.9619(5);R299.9620(2);R299.9611-9612 Requirements are not applicable because HWMA hazardous waste was placed at the site prior to the effective dates. Requirements are relevant and appropriate since they regulate circumstances sufficiently similar to the site.
AIR POLLUTION ACT (A)		
APA - ACT 348 Rules containing emissions limitations and prohibitions for particulate matter, fugitive dust, and VOCs.	MAC R336.1371-R336.1373 Requirements are applicable since construction operations at the site are potential sources of fugitive dust.	MAC R336.1371-R336.1373;R336.1901; R336.1301;R336.1331;R336.1702 Requirements are applicable since excavation and construction operations at the site are potential sources of fugitive dust. Excavation operations would be subject to State standards for emissions of VOCs and particulate matter.
SOIL EROSION SEDIMENTATION CONTROL ACT (A)		
SESCA - ACT 347 Regulations prescribing the requirements for soil erosion and sedimentation control measures and procedures.	MAC R323.1701-R323.1714 Requirements are applicable since construction operations would involve earth changes and the potential for soil erosion.	MAC R323.1701-R323.1714 Requirements are applicable since excavation and construction operations would involve earth changes and the potential for soil erosion.
FROST LAWS (A AND L)		
MCLA - 257.722 Rules governing the reduction of maximum axle loads during the period of March - May.	Section 257.722 Requirement is applicable since materials could be transported to the site from March to May.	Section 257.722 Requirement is applicable since materials could be transported to the site from March to May.

Table 2 - Page 7

	ALTERNATIVE 4 MULTI-MEDIA CAP	ALTERNATIVE 5 EXCAVATION/MULTI-MEDIA CAP
MINERAL WELL ACT (A)		
MINERAL WELL ACT 315 Rules describing the permitting requirements for drilling brine, storage, disposal, and test wells.	MAC R299.2211-R299.2229 Requirements are applicable since monitoring wells will be installed up and downgradient of the capped area, as part of groundwater monitoring requirements (R299.9612).	MAC R299.2211-R299.2229 These requirements are applicable since monitoring wells will be installed up and downgradient of the capped area, as part of the groundwater monitoring requirements (R299.9612)
ENDANGERED SPECIES ACT (L)		
ENDANGERED SPECIES ACT Rules contain a listing of the fish, wildlife, and plant species that have been determined to be endangered or threatened.	Mac R299.1021-R299.1028 Requirements are applicable since one threatened species, the Dwarf Hackberry (Ammocrypta pellucida), and one special concern species, the Dwarf Hackberry (Celtis tennifolia), have been reported to occur on or near the site.	MAC R299.1021-R299.1028 Requirement are applicable since one threatened species, the Eastern Sand Darter (Ammocrypta pellucida), and one special concern species, the Dwarf Hackberry (Celtis tennifolia), have been reported to occur on or near the site.
MICHIGAN WATER RESOURCES COMMISSION ACT (A AND C) ***		
NNRCA - ACT 245 Statute and rules protect groundwater resources from injurious substances and provide for the non-degradation of groundwater.	Section323.6(1) MAC R323.2201et.seq. Requirement is applicable because hazardous substances exist in the soils which may discharge to the groundwater. Remedy prevents such discharge.	Section 323.6(1) MAC R323.2201 et.seq. Requirement is applicable because hazardous substances exist in the soils which may discharge to the groundwater. Remedy prevents such discharge.

*** The State has identified Michigan Act 245, Part 22 Rules as an applicable ARAR. The United States disagrees that Act 245, as interpreted and applied by the State in this matter, is an ARAR. This issue is the subject of litigation in U.S. v. Akzo Coatings of America, appellate case numbers 89-2902 and 89-2137.

Table 2 - Page 8

	ALTERNATIVE 4 MULTI-MEDIA CAP	ALTERNATIVE 5 EXCAVATION/MULTI-MEDIA CAP
	ENVIRONMENTAL RESPONSE ACT RULES (A AND C)	
ENVIRONMENTAL RESPONSE ACT RULES Rules describe cleanup criteria for response activities.	MAC R299.5601-R299.5727 Parts 6 and 7 of the Act 307 Rules provide that remedial actions be protective of public health, safety, and welfare and the environment and natural resources, and the attainment of of cleanup standards under Type A, B, or C cleanup. Parts 6 and 7 are ARARs for the remedial action.	MAC R299.5601-R299.5727 Parts 6 and 7 of the Act 307 Rules provide that remedial actions be protective of public health, safety, and welfare and the environment and natural resources, and the attainment of cleanup standards under Type A, B, or C cleanup. Parts 6 and 7 are ARARs for the remedial action.

Table 3 – ARARs Summary for No Action and Treatment Alternative for the Rasmussen Groundwater Plume		
	NO ACTION ALTERNATIVE	TREATMENT ALTERNATIVE
FEDERAL ARARs		
RESOURCE CONSERVATION AND RECOVERY ACT (A and C)		
RCRA 40 CFR 268 Land disposal restrictions.	Not An ARAR	40 CFR 268 Subtitle C Requirement is applicable since chemical sludges will need to be TCLP tested for proper disposal.
RCRA 40 CFR 264 Standards for owners and operators of hazardous waste treatment storage and disposal facilities.	Not an ARAR	40 CFR 264.94; 264.100 These requirements are not applicable since groundwater is not contaminated with RCRA hazardous waste. Requirements are relevant and appropriate since they regulate circumstances sufficiently similar to those at the site.
		40 CFR 264.301; 264.303-304; 264.310; 40 CFR 264.91-100; 264.111; 264.116-117 RCRA hazardous waste (chemical precipitation sludge) would be placed in a landfill, and covered with a cap. Therefore, these requirements are applicable.
		40 CFR 264.271; 264.273; 26... These requirements are not applicable since non-RCRA hazardous wastes (bio treatment sludge) would be land treated. Requirements are relevant and appropriate since they regulate circumstances sufficiently similar to those at the site.
RCRA 40 CFR 263 Standards applicable to transporters of hazardous waste.	Not an ARAR	40 CFR 263 Transfer requirements are applicable for all off-site shipments of hazardous waste (chemical precipitation sludge).
RCRA 40 CFR 262 Standard applicable to generators of hazardous waste.	Not an ARAR	40 CFR 262 Hazardous waste generator requirements would be applicable for all hazardous wastes transported off-site (chemical Precipitation (sludge).

Table 3 - Page Two		
	NO ACTION ALTERNATIVE	TREATMENT ALTERNATIVE
SAFE DRINKING WATER ACT (C)		
SDWA 40 CFR 141 Regulations to protect human health from drinking water contaminants. Establishes MCLs and MCLGs.	40 CFR Part 141 Requirement is not applicable since the aquifer under the site is not used to supply a community or non-community water system. Requirement is relevant and appropriate since it regulates circumstances sufficiently similar to those at the site.	40 CFR Part 141 Requirement is not applicable since the aquifer under the site is not used to supply a community or non-community water system. Requirement is relevant and appropriate since it regulates circumstances sufficiently similar to those at the site.
CLEAN AIR ACT (A)		
CAA 40 CFR 50 Requirements establish the National Primary and Secondary Ambient Air Quality Standards for among other things, particulate matter	Not an ARAR	40 CFR 50.1-50.12 Requirements are applicable since emissions from the treatment system would be subject to Primary and Secondary Ambient Air Quality Standards. Construction activities would be subject to the TSP standard.
OCCUPATIONAL SAFETY AND HEALTH (A)		
OSHA 29 CFR 1910 Occupational safety and health standards adopted to provide safe or healthful employment.	Not an ARAR	29 CFR 1910.120 Requirement is applicable since construction operations would take place at a hazardous waste site designated for cleanup.
OCCUPATIONAL SAFETY AND HEALTH (A)		
OSHA 29 CFR 1926 Regulations set forth the safety and health standards for construction activities.	Not an ARAR	29 CFR 1926 Requirement is applicable for all on-site construction related activities.

Table 3 - Page Three		
	NO ACTION ALTERNATIVE	TREATMENT ALTERNATIVE
DEPARTMENT OF TRANSPORTATION (A)		
DOT 49 CFR 107 Prescribes the procedures utilized by the Materials Transportation Bureau, OHMP and COE for transport of hazardous materials.	Not an ARAR	49 CFR 107 Requirement is applicable since hazardous wastes (chemical precipitation sludge) would be transported to an off-site disposal facility.
DOT 49 CFR 171 Contains general information, regulations, and definitions governing the transportation of hazardous materials.	Not an ARAR	49 CFR 171 Requirement is applicable since hazardous wastes (chemical precipitation sludge) would be transported to an off-site disposal facility.

Table 3 - Page Four		
	NO ACTION ALTERNATIVE	TREATMENT ALTERNATIVE
STATE ARARs		
HAZARDOUS WASTE MANAGEMENT ACT (A)		
HWMA - Act 64 Regulations containing standards for generators and transporters of haz. waste, and owners of TSDFs.	Not an ARAR	MAC R299.9612 Requirements are not applicable since groundwater is not contaminated with HWMA waste. Requirements are relevant and appropriate since they regulate circumstances sufficiently similar to those at the site.
		MAC R299.9602-9604; R299.9611-9613;R299.9619-9622 Requirements are applicable because HWMA waste (chemical precipitation sludge) would be placed in a capped landfill.
		MAC R299.9301-R299.9311 Hazardous waste generator requirements would be applicable for all wastes transported off-site (chemical precip. sludge).
		MAC R299.9404-R299.9412 Transporter requirements are applicable for all wastes transported off-site (chemical precip. sludge).
		MAC R299.9618 Requirements are not applicable since non-HWMA wastes (bio treatment sludge) would be land treated. Requirements are relevant and appropriate since they regulate circumstances sufficiently similar to those at the site.
AIR POLLUTION ACT (A)		
APA - ACT 348 Rules containing emissions limitations and prohibitions for particulate matter, fugitive dust, and VOCs.	Not an ARAR	MAC R336.1702;R336.1901; R336.1371-1373 Requirements are applicable since emissions from the treatment system would be subject to State standards for VOCs. Construction activities are potential sources of fugitive dust.

Table 3 - Page Five		
	NO ACTION ALTERNATIVE	TREATMENT ALTERNATIVE
SOIL EROSION SEDIMENTATION CONTROL ACT (A)		
SESCA - ACT 347 Regulations prescribing the requirements for soil erosion and sedimentation control measures and procedures.	Not an ARAR	MAC R323.1701-R323.1714 Requirements are applicable since construction would involve earth changes and the potential for soil erosion.
FROST LAWS (A and L)		
MCLA - 257.722 Rules governing the reduction of maximum axle loads during the period March - May.	Not an ARAR	Section 257.722 Requirement is applicable since wastes (chemical precipitation and bio treatment sludges) could be transported from the site during the period March - May.
SAFE DRINKING WATER ACT (C)		
SDWA - Act 399 Regulations establishing MCLs for certain contaminants in addition to the Federal MCLs.	MAC R325.10601-R325.10607 Requirements are not applicable since the aquifer underlying the site is not used to supply a community or non-community water system. Requirement is relevant and appropriate since it regulates circumstances sufficiently similar to those at the site.	MAC R325.10601-R325.10607 Requirements are not applicable since the aquifer underlying the site is not used to supply a community or non-community water system. Requirement is relevant and appropriate since it regulates circumstances sufficiently similar to those at at the site.

Table 3 - Page Six

	NO ACTION ALTERNATIVE	TREATMENT ALTERNATIVE
MICHIGAN WATER RESOURCES COMMISSION ACT (A and C) ***		
NWRCA - ACT 245 This statute and rules protect groundwater resources from injurious substances. Rules contain State water quality standards, treatment plant operator requirements, and wastewater reporting requirements. The rules also implement a waste effluent discharge system compatible with NPDES and provide for the non-degradation of groundwater.	Section 323.6(a) Requirement is applicable since injurious substances from hazardous waste leachate would continue to migrate through the groundwater.	Section 323.6(a); MAC R323.2102-R323.2189; R323.2201-R323.2211; R323.1251-R323.1259 Requirements are applicable since injurious substances are migrating through the groundwater a waste treatment system would be constructed and operated on-site, and the effluent discharged into the groundwater.
[illegible] ACT (A)		
[illegible] - ACT 98 [illegible] 368 Rules for classification of sewage or waste treatment plant operators. Rules also contain procedures for construction and operation and maintenance of treatment plants.	Not an ARAR	R323.3801-R323.3833 Requirements are applicable since a waste treatment facility would be constructed and operated on-site.
MINERAL WELL ACT (A)		
MINERAL WELL ACT ACT 315 Rules describing the permitting requirements for drilling brine, storage, disposal, and test wells.	Not an ARAR	MAC R299.2211-R299.2229 Requirements are applicable since extraction, injection and monitoring wells would be installed on site.

***The State has identified Michigan Act 245, Part 22 Rules as an applicable ARAR. The United States disagrees that Act 245, as interpreted and applied by the State in this matter, is an ARAR. This issue is the subject of litigation in U.S. v. Akzo Coatings of America, appellate case numbers 89-2902 and 89-2137.

Table 3 - Page 7

	NO ACTION ALTERNATIVE	TREATMENT ALTERNATIVE
NATURAL RIVERS ACT (L)		
NATURAL RIVERS ACT Promotes public health and prevents ecological damage due to the unwise development within the natural river district.	Not an ARAR	Not an ARAR
INLAND LAKES AND STREAMS ACT 346 Regulates all activities below the high water mark on inland lakes and streams.	Not an ARAR	Not an ARAR
WETLANDS PROTECTION ACT 203 Provides for the preservation, management, protection and use of wetlands by prohibiting certain activities requiring permits and imposing penalties for violations of the Act.	Not an ARAR	Not an ARAR
ENDANGERED SPECIES ACT (L)		
ENDANGERED SPECIES ACT 203 Rules contain a listing of the fish, wildlife and plant species that have been determined to be endangered or threatened.	Not an ARAR	MAC R299.1021-R299.1028 Requirements are applicable since one threatened species, the Eastern Sand Darter (Ammocrypta pellucida), and one special concern species, the Dwarf Hackberry (Celtis tennifolia), have been reported to occur on or near the site.

	NO ACTION ALTERNATIVE	TREATMENT ALTERNATIVE
ENVIRONMENTAL RESPONSE ACT RULES (C)		
ENVIRONMENTAL RESPONSE ACT RULES Rules describe cleanup criteria for response activities.	MAC R299.5601 R299.5727 Parts 6 and 7 of the Act 307 Rules provide that remedial actions be protective of public health, safety, and welfare and the environment and natural resources, and the attainment of cleanup standards under Type A, B, or C cleanup. Parts 6 and 7 are ARARs for the remedial action.	MAC R299.5601 R299.5727 Parts 6 and Parts 6 and 7 of the Act 307 Rules provide that remedial actions be protective of public health, safety, and welfare and the environment and natural resources, and the attainment of cleanup standards under Type A, B, or C cleanup. Parts 6 and 7 are ARARs for the remedial action.

KEY TO TABLE 5 SYMBOLS

A = Denotes an Action Specific ARAR

C = Denotes a Chemical Specific ARAR

L = Denotes a Location Specific ARAR

The groundwater cleanup standards and soil cleanup compliance points chosen for this site (for all Action Alternatives) are based on Section 121 of CERCLA and the NCP. The substantive provisions of Michigan Act 307 Rules, Parts 6 and 7, are ARARs consistent with the provisions under CERCLA Section 121(d)(2)(A)(ii), for the remedial action to be undertaken at the Rasmussen site. The Act 307 Rules provide that remedial actions shall be protective of public health, safety, welfare, the environment and natural resources (R299.5601(1)). Criteria for Types A, B, and C cleanups within the Act 307 Rules provide for the derivation of cleanup standards and compliance points which meet the protectiveness goals stated above. The U.S. EPA and the State agree on the remedy and cleanup standards, since the groundwater is currently used as a drinking water source, and is contaminated, and the soils areas pose a continued current and potential threat to the groundwater resource, if left unremediated.

More detail with regard to compliance with ARARs is provided in this ROD under "Statutory Determinations".

3. Long-term Effectiveness and Permanence refers to the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met.

Neither of the No Action Alternatives for the soils or the groundwater would be effective long-term solutions to the problems at the site, as they do not address existing or future site risks. The groundwater treatment alternative would provide the greatest reduction in the potential for exposure to groundwater contaminants. This alternative is expected to reduce contaminant concentrations to the cleanup levels. Estimates indicate that long-term protection would be achieved in 5 to 15 years, as the treatment system would reduce the concentration of contaminants over time.

Reintroduction of treated groundwater through the PDSLD/IW areas of concern, by use of seepage basins, will flush the contaminants in the PDSLD/IW soils into the groundwater plume, with subsequent removal by ground water extraction and treatment system. This closed-loop treatment system will provide the best long-term protection of the alternatives considered.

Long term effectiveness would be slightly greater with the multi-media cap than with the clay cap. Long-term management requirements and the consequences of cap failure would be similar for each of the four soils action alternatives. A multi-media cap may require a more-involved maintenance program than the clay cap and, therefore, presents greater uncertainty with regard to cap failure.

4. Reduction of Toxicity, Mobility or Volume Through Treatment refers to the ability of a remedy to meet the preferance stated in Section 121(b) of CERCLA, for remedies that involve treatment to reduce permanently the toxicity, mobility, or volume of hazardous substances and contaminants.

The groundwater treatment alternative would nearly eliminate the toxicity, mobility, and volume of contaminants in the site's groundwater because of contaminant removal and destruction. Heavy metal contaminants are precipitated from the process stream, dewatered, stabilized, and disposed of off-site at a permitted facility. The biological treatment process will remove most of the volatile and semivolatile organic contaminants, including ketones, which are less readily removed by air stripping and carbon adsorption. The remaining organic contaminants removed by carbon adsorption, and are destroyed during the off-site reactivation of the carbon.

Contaminants washed through the soil by the seepage basins in Alternative 7 would ultimately be reduced in toxicity, mobility, and volume through treatment by removal in the extraction and treatment system.

The No Action groundwater Alternative does not reduce toxicity, mobility, or volume except for the removal of contamination by natural biological processes over time.

None of the site-wide soils alternatives contributes to the reduction in toxicity, mobility, or volume of contaminants as no treatment is utilized in these alternatives.

5. Short-term Effectiveness addresses the ability of alternatives to manage risks during the construction and implementation phases, and reduce immediate risks posed by the hazardous materials present.

During the design and construction of the selected alternative, the short-term risks potentially posed to the community and workers can be effectively eliminated through proper engineering measures and protective equipment for workers. Alternatives 2 through 5 present similar short-term risks to workers and community. The alternatives including further excavation pose slightly higher risks from dust exposure during the excavation activities. Remedial action objectives would be met after construction of the Act 64 cap. Alternative 7 should effectively address the short-term risks posed to the community and workers by contaminated groundwater. Remedial action objectives would begin to be met after start-up of the treatment system. Ongoing monitoring of private wells in the community will be continued as needed until groundwater cleanup is complete. This criteria does not apply to the No Action Alternative.

6. Implementability is the technical and administrative feasibility of a remedy, including the availability of goods and services needed to implement the chosen solution.

Technical feasibility: The individual technologies used in each of the action alternatives are conventional and well documented. Unusual features are not anticipated to be required for any of the alternatives but will be resolved during the design phase, if encountered. Potential future actions such as removal of contaminated source materials or on-site treatment would be possible under any of the alternatives. There are no differences in the alternatives' ability to be monitored for effectiveness.

Administrative feasibility: Alternatives 2 through 5 and Alternative 7 are more administratively feasible than the No Action Alternatives 1 and 6, since they address the final remedial action objectives of the site (to varying degrees). Alternatives 2 through 5 require similar coordination between Agencies and other potentially affected interests. The No Action Alternative would require substantial ongoing review effort by State and Federal Agencies.

Availability of services and materials: The technologies used under each of the soils action alternatives are conventional and similar. Alternative 7 does not require any obscure services.

7. Cost includes capital and operation and maintenance costs.

The costs of individual alternatives are detailed above. The No Action Alternatives have no direct costs associated with them. The alternatives with excavation are more costly than those without. Likewise, multi-media caps are more expensive than the single-media clay caps.

Since the groundwater purge and treat system is being considered as an integral part of the treatment for a portion of the contaminated soils areas, and for the treatment of existing contaminated groundwater, savings are incurred by use of this procedure. As stated previously, Alternative 7 costs roughly $150,000 more with the use of a seepage basin rather than reinjection wells. Alternative 4, without excavation, costs roughly $144,500 less than Alternative 5, with excavation. The multi-media cap costs $2 million more than the clay cap, and cannot be economically justified based on the marginal improvement in reducing water infiltration. The remedy afforded by the combination of Alternatives 7 and 2 can be implemented at little additional cost, while achieving removal and partial destruction of soil contamination in the PDSLD/IW area.

8. Support Agency Acceptance indicates whether, based on its review of the Feasibility Study and Proposed Plan, the support agency concurs, opposes, or has no comment on the preferred alternative.

The United States Environmental Protection Agency and the State of Michigan agree upon the selected remedy.

9. Community Acceptance is detailed in the attached Responsiveness summary.

Specific comments received from area residents indicate that the community supports the groundwater remediation program, but would prefer to have the dump contents either incinerated or removed from the site. The residents expressed a desire that a financial vehicle be established to guarantee cap maintenance in perpetuity. The Responsiveness Summary gives a detailed list of concerns expressed in writing and verbally at the public meeting.

The PRPs generally support the site wide remedy but take issue with the cap design details and criteria used to establish the chemicals of concern and cleanup levels indicated in Table 1. The PRPs also felt that the capital costs would be much greater than the plus 50 percent upper bound called for in the National Contingency Plan.

The Selected Remedy

The preferred alternative for the Rasmussen groundwater plume, Alternative 7, includes the following process options:

* extraction of groundwater to capture and halt the flow of the plumes.
* removal of heavy metal contaminants by chemical precipitation followed by pH adjustment (if necessary).
* removal of several organic contaminants, including ketones, by a biological treatment system.
* removal of residual organic contaminants via air stripping.
* further removal of residual organic contaminants via granular activated carbon (GAC) (or other carbon adsorption methodology, if necessary).
* discharge of treated water to the groundwater via a seepage basin situated over the IW and PDSLD soils areas of concern.
* groundwater monitoring through a system of wells to assess the effectiveness of the system at:
    * halting the migration of contamination.
    * reducing the levels of contamination in the soils and groundwater, over time.
* a process effluent sampling program to aid in determining the treatment system's effectiveness.
* fencing and deed restrictions, as necessary, to ensure the integrity of the remedy.

Residential well sampling will be continued, in conjunction with that called for in the final remedial actions at the neighboring Spiegelberg Superfund Site.

The final processes to be installed for groundwater cleanup will be determined by treatability studies during the design.

Since contamination has been confirmed in the location of groundwater monitoring well RA-MW-27, groundwater will need to be purged from this location and will need to be manifolded into the treatment system feed supply line for treatment prior to discharge.

The preferred site-wide alternative for the Rasmussen soils areas of concern is Alternative 2, which includes:

* A Michigan Act 64 clay cap constructed over all wastes in the TML and NEBD areas of concern as they now exist spatially on-site. This includes:
  * a one-foot thick vegetated soil layer on top,
  * a drainage layer at least 1 foot thick, and
  * a layer of compacted clay 3 feet thick with a permeability of 1E-07 cm/sec or less.
* A groundwater monitoring program established at appropriate locations, depths, and frequency, to detect any changes in groundwater quality, which would indicate any failure of the unit.
* Access restrictions, such as fencing, will be placed around the capped soil areas.
* Institutional controls, such as deed restrictions, will be put in place to prevent future intrusive land uses.
* Drums of waste which are currently visible, or which are unearthed during cap implementation, will be disposed of at a licensed RCRA facility.

This portion of the final remedial action will require long-term management to ensure that the integrity of the capping system is not compromised. The access restrictions and fencing will aid in this effort. Long-term management efforts will include periodic well sampling, cap inspection and repair (if necessary), and maintenance of vegetative cover.

Details of the capping construction such as the potential employment of terracing, rip-rapped drainage channels, and perimeter runoff collection will be detailed during the design phase of remedial action.

Actual or threatened releases of hazardous substances from this site, if not addressed by the preferred alternative or one of the other active measures considered, may present a current or potential threat to public health, welfare, or the environment.

1. Attainment of Goals

Both MDNR and EPA have determined that the remedy selected provides the best balance among the nine criteria and meets the requirements of CERCLA.

Attainment of the groundwater goals of this remedy is dependant on the meeting of the cleanup levels for groundwater specified in Table 1. When realized, the groundwater remediation will reduce risk to levels consistent with applicable or relevant and appropriate Federal and State requirements, and thus will be protective of human health and the environment.

Completion of the soil flushing portion of this remedy is measured against the reduction of contaminants in the PDSLD/IW soils areas of concern to levels which will not produce leaching of contaminants to groundwater at levels above groundwater cleanup standards (Table 1). Once this cleanup objective has been met, a Type B cleanup level for the PDSLD/IW soils will have been achieved (R299.5711(2)). The compliance point for measuring PDSLD/IW cleanup is described in the next section.

Completion of the capping/monitoring system for the NEBD/TML dump area is the point where the remediation goals for these areas begin to be met. Continued operation and maintenance of the capped areas will ensure the continued attainment of these goals.

2. Compliance Points

Compliance points to be measured during the course of the groundwater remediation, to determine the progress towards and attainment of protective groundwater levels, are: analysis of the treatment system effluent to directly determine the effectiveness of the treatment and to prevent the re-release of inadequately treated chemicals to the environment; and, monitoring well analysis to determine the effectiveness of the treatment system at halting the flow of contaminated groundwater, and to monitor changes in the contaminant concentrations within the plume itself. Residential well monitoring in the direction of groundwater flow will be continued to ensure that these resources remain unaffected. Specifically, the area of attainment to be monitored for the completion of the Rasmussen groundwater contamination remediation extends throughout the plume in the upper aquifer in the area underlying the Rasmussen site. Groundwater cleanup will be measured against those levels listed in Table 1.

The risk posed by the PDSLD/IW areas of concern, as previously noted, is the risk posed by the migration of contamination into the groundwater resource. The objective of the soil flushing portion of the remedy is to eliminate the leaching of contaminants to the groundwater. In order to determine

compliance with this objective, the contaminant level in the PDSLD/IW soils must be reduced to less than twenty times the groundwater cleanup level for each chemical, or leach tests performed on the PDSLD/IW soils must produce leachate with contaminant levels below the groundwater cleanup levels (R299.5711(2)), or the results of other test methods (other than TCLP) that accurately simulate conditions at the site must be employed to demonstrate that contaminants are not leaching into the groundwater above the groundwater cleanup levels.

Measurements of cap effectiveness will be conducted through the use of a monitoring well system installed in conjunction with cap construction.

3. Contingencies

Some changes may be made to the remedy as a result of the design studies. However, the cleanup goals must be met by the remedy that is implemented. The following are some of the outstanding issues which will be resolved during negotiations, remedial design, and final remedial action: general system design; site access; maintenance and monitoring; residential well sampling plan; monitoring well placement and sampling frequency; oversight; future Potentially Responsible Party involvement; and, determination of background lead and cadmium concentrations.

Statutory Determinations

The selected remedy will control and reduce risks associated with the Chemicals of Concern in the Rasmussen groundwater plume and PDSLD/IW areas of concern. Engineering controls (cap) in conjunction with long-term maintenance and institutional controls will provide adequate protection of human health and the environment from the dump and inclusive areas of concern. The statutory requirements of CERCLA Section 121 will be satisfied to the extent practicable with the implementation of the chosen remedy. The following is an enumeration of how the selected remedy addresses each requirement.

1. Protection of Human Health and the Environment

The selected remedy will provide adequate protection of human health and the environment through the combined use of treatment, engineering and institutional control technologies. Risks associated with contact or consumption of site groundwater will decrease over time because the extraction and treatment system will reduce the concentration of all contaminants to the cleanup levels specified in Table 1. Risk reduction will also be realized upon completion of the flushing and capping portions of the remedy. At completion of this remedy, the carcinogenic risk will be reduced to levels considered protective by the Michigan Act 307 Rules criteria, and well within the EPA's 1E-04 to 1E-06

range. Carcinogenic risk associated with the Rasmussen site's groundwater is currently 7.3E-03. The implementation of the treatment system and the attainment of the required cleanup levels would reduce the carcinogenic risk to 9.2E-05. Non-carcinogenic risk will be reduced to levels acceptable to MDNR and U.S. EPA and consistent with CERCLA. Flushing and extraction will ultimately reduce the PDSLD/IW soil contamination levels to that which will not leach into groundwater at levels above groundwater cleanup standards (R299.5711(2)). The site-specific capping remedy for the remaining soils areas will afford aquifer protection from the effects of residual soil contamination. With proper engineering controls, unacceptable short-term risks will be not be caused by the implementation of this remedy.

2. Compliance with Applicable or Relevant and Appropriate Requirements

The remedy selected will meet or attain the applicable or relevant and appropriate Federal and State requirements, and will be implemented in a manner consistent with these laws. Tables 2 and 3 list all of the Applicable or Relevant and Appropriate Requirements (ARARs), and indicate why each is an ARAR for the selection or implementation of the chosen Rasmussen site final remedial action.

In particular, the final remedial action selected for implementation at the Rasmussen site is consistent with the National Contingency Plan and the State's Act 307 Rules. The State has identified Michigan Act 245 Part 22 Rules as an ARAR for the Rasmussen site. The United States disagrees that Michigan Act 245 Part 22 Rules, as interpreted and applied by the State, is an ARAR. This issue is the subject of litigation in U.S. v. Akzo Coatings of America, appellate case numbers 89-2902 and 89-2137. The State agrees with the remedy selected and has indicated that achieving the Act 307 groundwater cleanup requirements in treated groundwater prior to reintroducing it into the aquifer will satisfy the requirements of Act 245.

The groundwater cleanup standards and soil cleanup compliance points chosen for this site are based on U.S. EPA's agreement with the State's recommendation of a combination of all three Types of cleanup for this site. Criteria for complying with the Type A, B, or C cleanups are contained in Michigan's Act 307 Rules. The substantive provisions, Parts 6 and 7 of the Act 307 Rules, are considered ARARs for the remedial action to be undertaken at the Rasmussen site. These Rules provide, inter alia, that remedial actions shall be protective of public health, safety, and welfare and the environment and natural resources (R299.5601(1)). The Act 307 Rules specify that this standard be achieved by a degree of cleanup which conforms to one or more of the Type A, B, or C cleanup criteria. A Type A

cleanup generally achieves cleanup to background or non-detectable levels (R299.5707); a Type B meets risk-based cleanup levels in all media (R299.5709, 5711, 5723, and 5725); and Type C cleanup is based on a site-specific risk assessment which considers specified criteria (R299.5717 and 5719). The selected remedy meets this ARAR.

U.S. EPA agrees with the State's recommendation given the fact that the groundwater is currently used as a drinking water source and is contaminated, and that the soils areas pose a continuing current and potential threat to the groundwater resource, if left unremediated.

The emission control requirements of the Clean Air Act (CAA) and the Michigan Air Pollution Control Act are potential ARARs for all alternatives except the No Action Alternative. Construction and treatment system activities are potential sources of fugitive dust, particulates and volatile organic compounds.

The selected remedy may involve the disposal of treatment residuals which are subject to RCRA Land Disposal Restrictions (LDRs). Although RCRA listed wastes have not been found at the site, some RCRA characteristic wastes were removed from the site during the 1989/1990 removal action. Consequently, treatment residuals will be tested to determine if they are RCRA characteristic wastes and subject to the LDRs. If treatment residuals are determined to be hazardous wastes under RCRA, and are transported off-site, the Department of Transportation Rules for the transportation of hazardous materials and RCRA will be applicable to any off-site movement or handling of the hazardous wastes.

Post Section 106 removal observations by EPA's oversight contractor and State staff have indicated that visible drums remain within the areas to be capped. These drums have become visible due to the freeze/thaw weathering cycle which causes slumping of dump and soil materials. The drums removed during the 1989/1990 action were found to contain RCRA characteristic wastes. Due to the fact that wastes removed were RCRA characteristic, and the fact that some drummed materials still remain, the probability exists for RCRA characteristic wastes and residuals to still remain within the TML/NEBD portion of the site. Based on these findings, both RCRA and Michigan Act 64 capping requirements were determined to be relevant and appropriate for closure of these areas.

3. Cost Effectiveness

The comparison of cost effectiveness versus protectiveness achieved is the primary factor for the selection of the combination of preferred alternatives for the Rasmussen site. Public comment for this site centered around the public's

expressed preference for complete removal and destruction of all contaminated soils areas including the dump rather than the proposed in-place site-specific remedy. It is also the Agencies statutorily mandated preference for technologies which employ permanent solutions and treatment technologies. The mandate is qualified by the phrase "to the Maximum Extent Practicable." Included in this qualifier is a requirement to balance cost with the effectiveness of a remedy at protecting public health and the environment. Removal and destruction of the dump contents would cost over $100 million. The proposed soils alternatives (including flushing) will cost approximately $10 million. The selected remedy outlined above affords overall effectiveness when measured against the 5 CERCLA Section 121 criteria and the 9 criteria from the National Contingency Plan, and costs are proportionate to the protectiveness which will be achieved.

4. Utilization of Permanent Solutions and Alternative Treatment (or resource recovery) Technologies to the Maximum Extent Practicable

The remedy employs the preferred permanent solutions and treatment technologies to the maximum extent practicable. The chosen alternative permanently removes the contaminants from the groundwater resource and flushed soils in the following manner: organic contaminants are extracted via air stripping and carbon adsorption, and are destroyed during the off-site reactivation of the carbon units; the activated sludge process removes and destroys most of the volatile and semi-volatile organic contaminants; and inorganic contaminants are precipitated from the process stream, dewatered, stabilized, and disposed of off-site at a permitted facility. The capping option does not employ permanent solutions or alternative treatment technologies.

5. Preference for Treatment as a Principal Element

The principal elements of the selected remedy are the treatment of the contaminated groundwater and flushed soil contaminants, and capping. These elements address the unacceptable risks at the site--the further degradation of groundwater resources, through the combined use of treatment and engineering technologies. Addressing all of the risks through treatment was not found to be cost effective. The chosen remedy, although not wholly a treatment process, is protective of public health and the environment.

Documentation of Significant Changes

The following is a documentation and rationale for significant changes made to the selected remedy since the issuance of the Proposed Plan in August of 1990. None of these changes require the issuance of a revised Proposed Plan or the announcement of a new Public Comment Period, as the remedy does not differ

substantively from that which was contemplated in the final stages of the Feasibility Study or the Proposed Plan.

There are two changes in the cleanup levels on Table 1 due to typographical errors in the Proposed Plan. For 1,1-dichloroethene the maximum concentration is 2.0 ppb instead of 590.0 ppb as indicated in the Proposed Plan. This reduces the carcinogenic risk number for 1,1-dichloroethene from 1.0E-02 to 3.4E-05.

Careful re-examination of RI results in response to PRP and public comment has shown levels of trichloroethene on three separate sampling occasions during the RI (240 ppb, 774 ppb, and 120 ppb) in Rasmussen Monitoring Well number 27 (RA-MW-27) (Figure 2). These results were inadvertently overlooked during the risk evaluation since they were recorded as "background" sample locations. Sampling conducted by the PRPs on two subsequent sampling occasions confirmed trichloroethene in RA-MW-27. The PRPs propose to remediate this area by the installation of a separate purge well in this location. The Agencies concur with this proposal, and add that the purged water from the southerly RA-MW-27 extraction well location will be manifolded into the treatment system feed header for treatment prior to discharge. Cleanup levels for groundwater contamination in this area are the same as found in Table 1.

Benzyl alcohol was noted in Table 1 of the Proposed Plan as requiring cleanup. The cleanup level for this chemical, based on Type B criterion was incorrectly calculated and reported as 9.0 ppb. The correct cleanup number based on these criterion is 10.0 ppm (10,000 ppb) based on data from the National Toxicology Program bioassay (1989). The site-derived concentrations of 12.0 ppb do not exceed the corrected cleanup level. Benzyl alcohol has been removed from the list of chemicals of concern for the Rasmussen groundwater plume.

The chemical 2-chlorophenol, has a cleanup level 0.1 ppb based on aesthetics data. However, consideration was not given for detectability. An acceptable method detection limit (MDL) for this chemical is 5.0 ppb. This MDL of 5.0 ppb is the cleanup goal. However, since the aesthetics criterion is significantly less than the MDL, the design should attempt to completely remove 2-chlorophenol from the groundwater.

Since the issuance of the Proposed Plan for the Rasmussen site, new RfD data became available in the IRIS database for 2,4-dimethylphenol. Based on this data, the new groundwater cleanup criterion for 2,4-dimethylphenol is 100 ppb. The maximum concentration detected in Rasmussen groundwater was 27.0 ppb. Therefore 2,4-dimethylphenol is deleted as a chemical of concern for the Rasmussen groundwater remediation.

Reevaluation of the aesthetics data for 2-methylphenol and 4-methylphenol have produced the following respective cleanup levels: 300 ppb and 400 ppb. Since 2-methylphenol was detected at 1,600 ppb, it remains as a chemical of concern with a revised cleanup level of 300 ppb. Since 4-methylphenol was detected on-site at 280 ppb and the cleanup level is set at 400 ppb, this chemical is deleted from the list of groundwater contaminants.

In the Proposed Plan the cleanup level for vinyl chloride was set at 0.18 ppb based on a MDL. The MDNR has recently issued a memorandum which lists MDLs for use with the Act 307 criteria. The memorandum lists the MDL for vinyl chloride at 1.0 ppb, therefore the cleanup number reported in Table 1 has changed to 1.0 ppb. Since the carcinogenic risk level for vinyl chloride is below what can be reliably detected, efforts should be made to detect the substance at levels below 1.0 ppb, and to remediate to those levels, if possible.

Tetrachloroethene was incorrectly reported as a detection of 2.0 ppb on-site. This detection was determined to be unreliable as both on-site and background samples were estimated values of 2.0 ppb. Tetrachloroethene was not reported in any other samplings, and is deleted from consideration as a chemical of concern.

Cadmium, as with lead, requires resampling during pre-design studies to confirm its presence as a dissolved contaminant. RI samples were analyzed for total cadmium. The cleanup level in Table 1 has been starred to indicate that the HLSC-based cleanup level of 4.0 ppb may be modified by further analyses. If studies (and split samplings) show that either 1) on-site filtered cadmium samples are less than 4 ppb, or 2) if on-site filtered cadmium samples are greater than 4 ppb, and on site filtered cadmium samples are less than background filtered cadmium samples, then cadmium may be deleted from the list of chemicals of concern.

STATE OF MICHIGAN

JOHN ENGLER, Governor

DEPARTMENT OF NATURAL RESOURCES

STEVENS T. MASON BUILDING
P.O. BOX 30028
LANSING, MI 48909

DAVID F. HALES, Director

March 28, 1991

Mr. Valdas Adamkus, Regional Administrator
U.S. Environmental Protection Agency
Region V, 5RA-14
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Adamkus:

The Michigan Department of Natural Resources (MDNR), on behalf of the State of Michigan, has reviewed the Record of Decision (ROD) for the Rasmussen Dump Site final remedial action, and the proposed remedy contained in that ROD. Michigan concurs with the remedy proposed in the ROD consisting of groundwater extraction and treatment, reinjection of treated groundwater via seepage basins to enhance contaminant migration and uptake, Michigan Act 64 capping of the dump and associated contaminated soil areas, deed restrictions and fencing to provide for the integrity of the remedy, and monitoring of groundwater and residential wells in the area.

The State also concurs with the analysis of legally applicable or relevant and appropriate requirements (ARARs) contained in Tables 2 and 3 of the ROD with respect to those ARARs identified in those tables. The State does not concur with the omission from that table, and from other references, of the Michigan Water Resources Commission Act 245, PA 1929, MCL 323.6(1) and the associated Part 22 Administrative Rules MAC R.323.2201 et.seq. The State has previously identified these requirements as ARARs for the remedial action being selected for this site.

The Water Resources Commission Act and the Part 22 Rules are ARARs for this remedial action for two reasons. First, hazardous substances in the aquifer beneath the site are migrating to degrade previously uncontaminated groundwater. Second, one element of the selected remedial action is discharge of purged, treated water back into the aquifer via seepage basins.

It is the Department's judgement that the selected remedial action for this site will provide for attainment of all ARARs including the Michigan Water Resources Commission Act Part 22 Rules. The remedial action will halt the migration of contaminated groundwater and restore the aquifer to a usable condition. The capping portion of the remedy will prevent future degradation of the groundwater

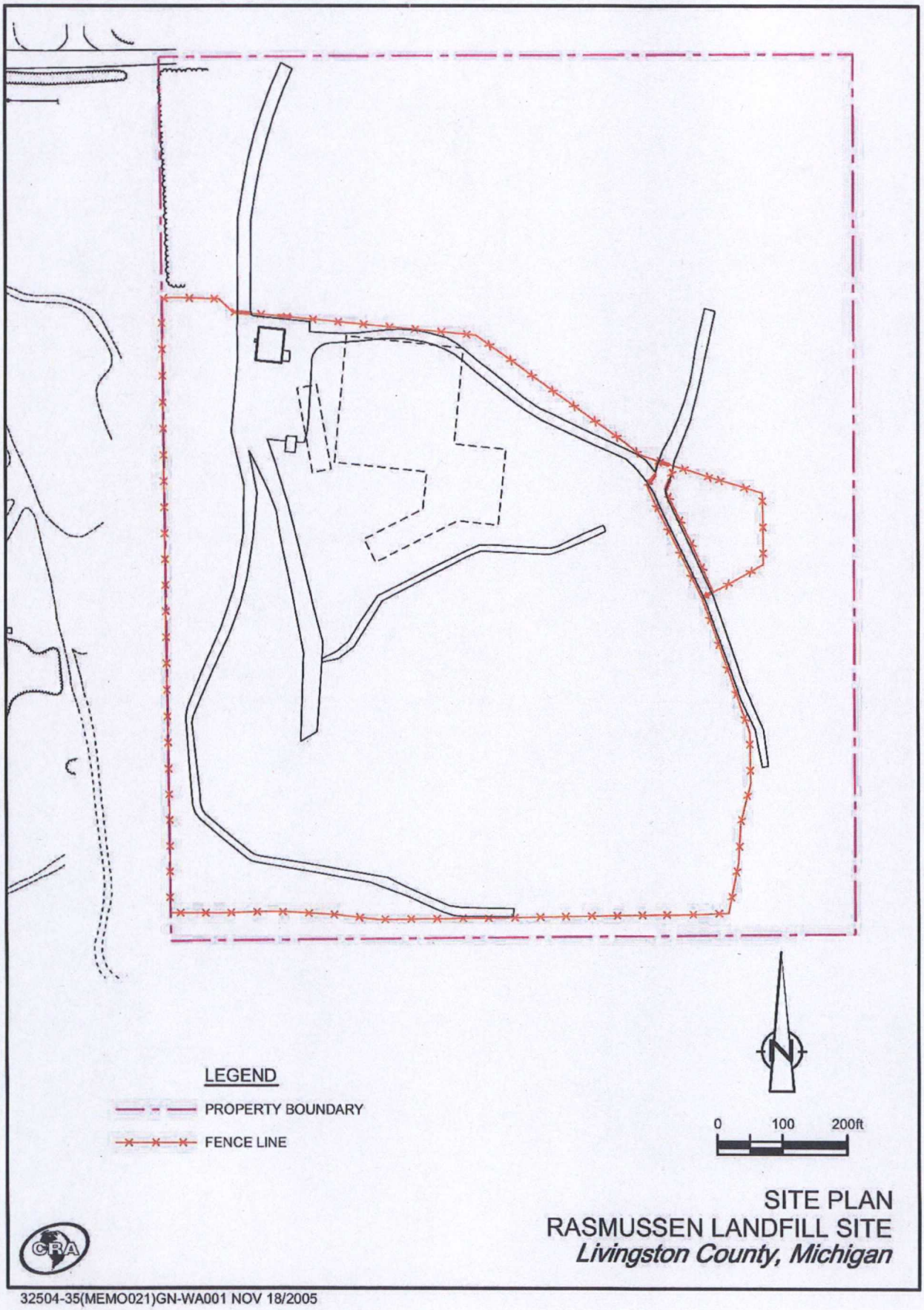
resource by preventing water infiltration. In addition, purged water will be treated prior to reinjection and then hydraulically contained on-site by the purge wells in a manner that will also prevent degradation of groundwater quality, consistent with the Water Resources Commission Act and Part 22 Rules.

We are pleased to be partners with you in selecting this remedy and look forward to working together to accomplish the final remedy at this site.

Sincerely,

Delbert Rector
Deputy Director
517-373-7917

cc: Ms. Susan Schneider, US DOJ
Mr. Jon Dikinis, US EPA
Ms. Alison Gavin, US EPA, ORC
Ms. Wendy Carney, US EPA
Mr. Ken Glatz, US EPA
Mr. Robert Reichel, AG
Mr. William Bradford, MDNR
Ms. Claudia Kerbawy, MDNR
Ms. Denise Gruben, MDNR



SITE PLAN
RASMUSSEN LANDFILL SITE
Livingston County, Michigan

32504-35(MEMO021)GN-WA001 NOV 18/2005

The prospective buyer should be given a copy of this document prior to closing.

The restrictions in this Deed Restriction shall run with the land and shall remain in full force and effect permanently.

James H. Spiegelberg has caused these Deed Restrictions to be executed this 15TH day of APRIL, 1995.

Seal

James H. Spiegelberg
JAMES H. SPIEGELBERG

ATTEST:

Mary C. Tummonds
MARY C. TUMMONDS

STATE OF MICHIGAN)
) SS:
COUNTY OF ~~LIVINGSTON~~ WASHTENAW)

Before me, a Notary Public in and for said County and State, personally appeared James H. Spiegelberg and acknowledged the execution of the foregoing Deed Restriction on the Spiegelberg Property.

Witness my hand and Notarial Seal the 15TH day of APRIL, 1995.

Mary C. Tummonds
Notary Public
~~Livingston~~ County, Michigan
My Commission Expires: 5-30-95

MARY C. TUMMONDS
Notary Public, Washtenaw County, Michigan
My Commission Expires May 30, 1995

JLE/18260/0356/AA5/5

DRAFTED BY: Steven C. Nadeau
Dickinson, Wright, Moon, Van Dusen & Freeman
500 Woodward Avenue, Suite 4000
Detroit, MI 48226

LIBER 1977 PAGE 0418

RECORDED

25
2-

Nov 7 1 20 PM '95

NANCY HAVILAND
REGISTER OF DEEDS
LIVINGSTON COUNTY, MI
48843

EXHIBIT D

DEED RESTRICTIONS

James H. Spiegelberg hereby imposes restrictions on the following described real estate known as the Spiegelberg Property in Livingston County, in the State of Michigan (the "Spiegelberg Property"):

> Section 30, T1N, R6E, A SE/4 of NE/4, EXC 10 A off south side of 30A, and NW/4 of NE/4 40 A and SW/4 of NE/4 40A.

The following restrictions are imposed upon the Spiegelberg Property described in this document for the purpose of permitting unimpeded performance of remedial action required pursuant to the Consent Decree approved by the United States District Court for the Eastern District of Michigan, Southern Division on April 30, 1992, in Civil Action No. 92-CB-40071-FL (the "Consent Decree") pertaining to the Rasmussen Superfund Site:

1. There shall be a permanent prohibition against mining, excavating, regrading or disturbing the soils along the South Slope Area of the Spiegelberg Property, as shown in the shaded area on Exhibit A and marked "Deed Restriction Area."

2. There shall be a permanent prohibition against mining, excavating, regrading or disturbing the soils along the east/west Spiegelberg/Rasmussen property boundary of the Spiegelberg Property as shown in the shaded areas on Exhibit A and marked "Deed Restriction Area."

3. There shall be a permanent prohibition against interference with any of the fourteen (14) current or any future additional monitoring wells on the Spiegelberg Property needed to implement the Rasmussen Site groundwater remedy.

4. There shall be a permanent prohibition against any disturbance, disruption or interference with any other aspects of the remedy implementation or the final constructed remedy for the Rasmussen Site.

Prior to any transfer of the Spiegelberg Property, the owner shall give at least sixty (60) days prior notice of the proposed transfer to the members of the RSRG and to U.S. EPA.

RETURN TO: Steven C. Nadeau
Dickinson, Wright, Moon, Van Dusen & Freeman
500 Woodward Avenue, Suite 4000
Detroit, MI 48226

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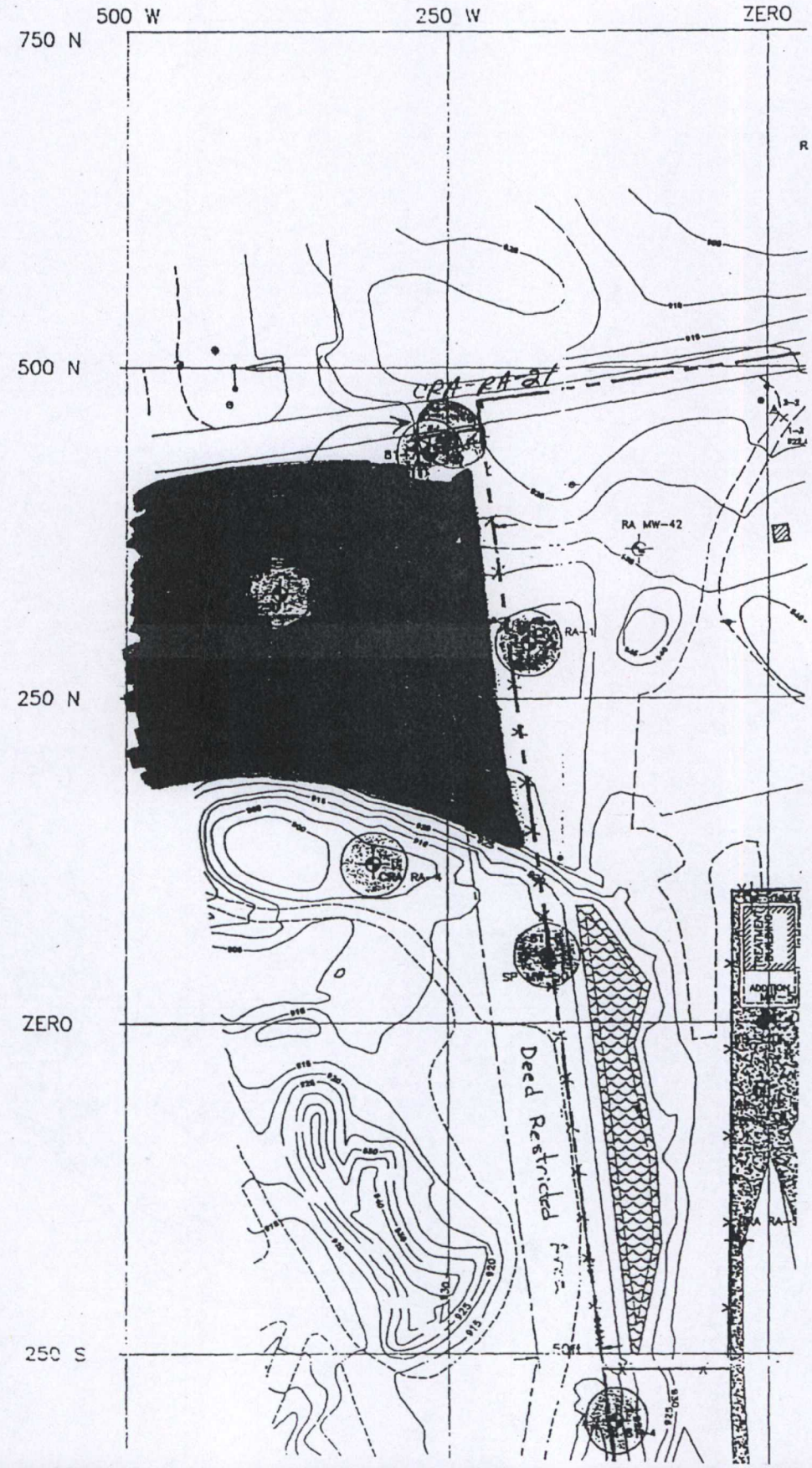
EXHIBIT "A"

LIBER 1977 PAGE 0420



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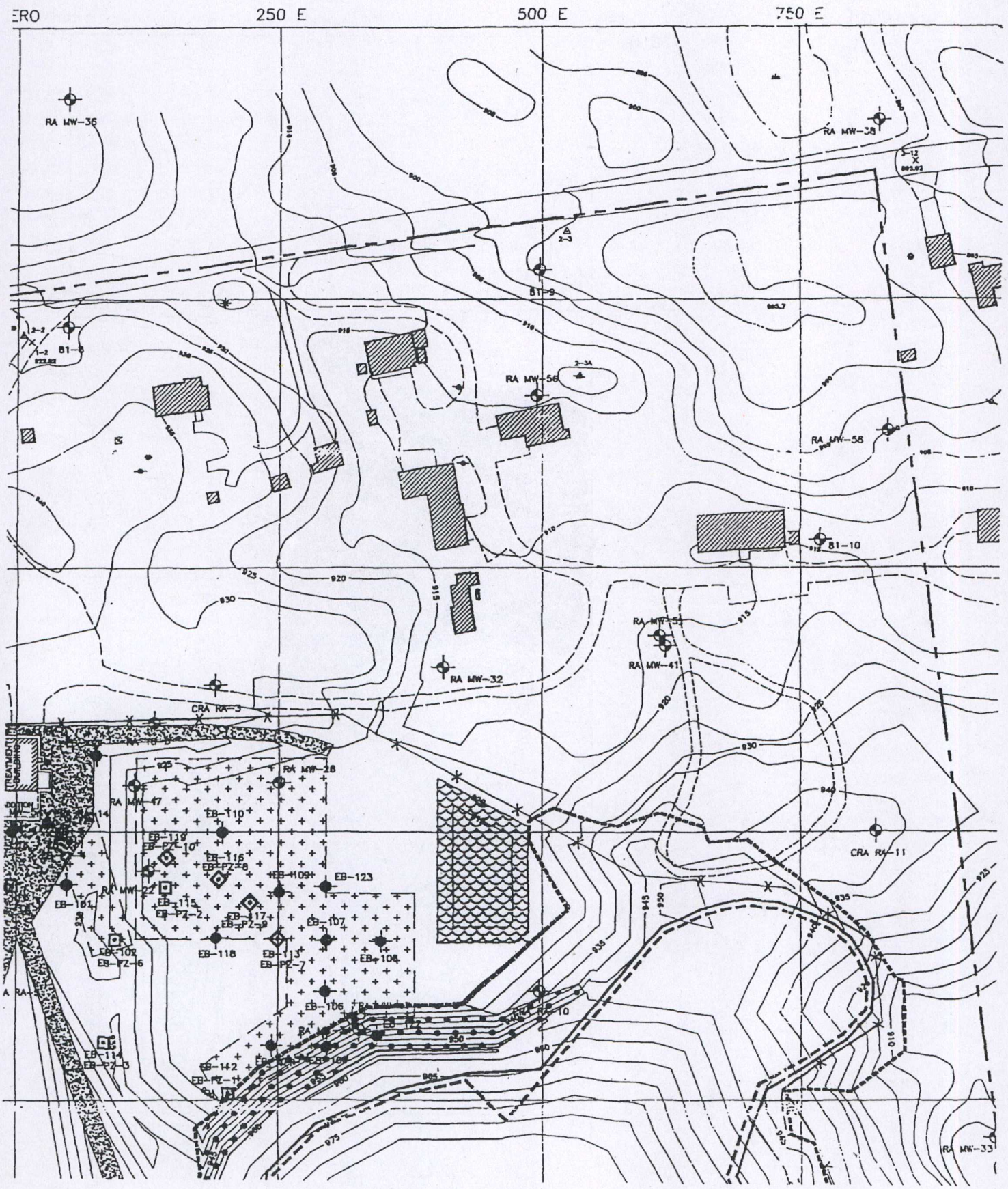

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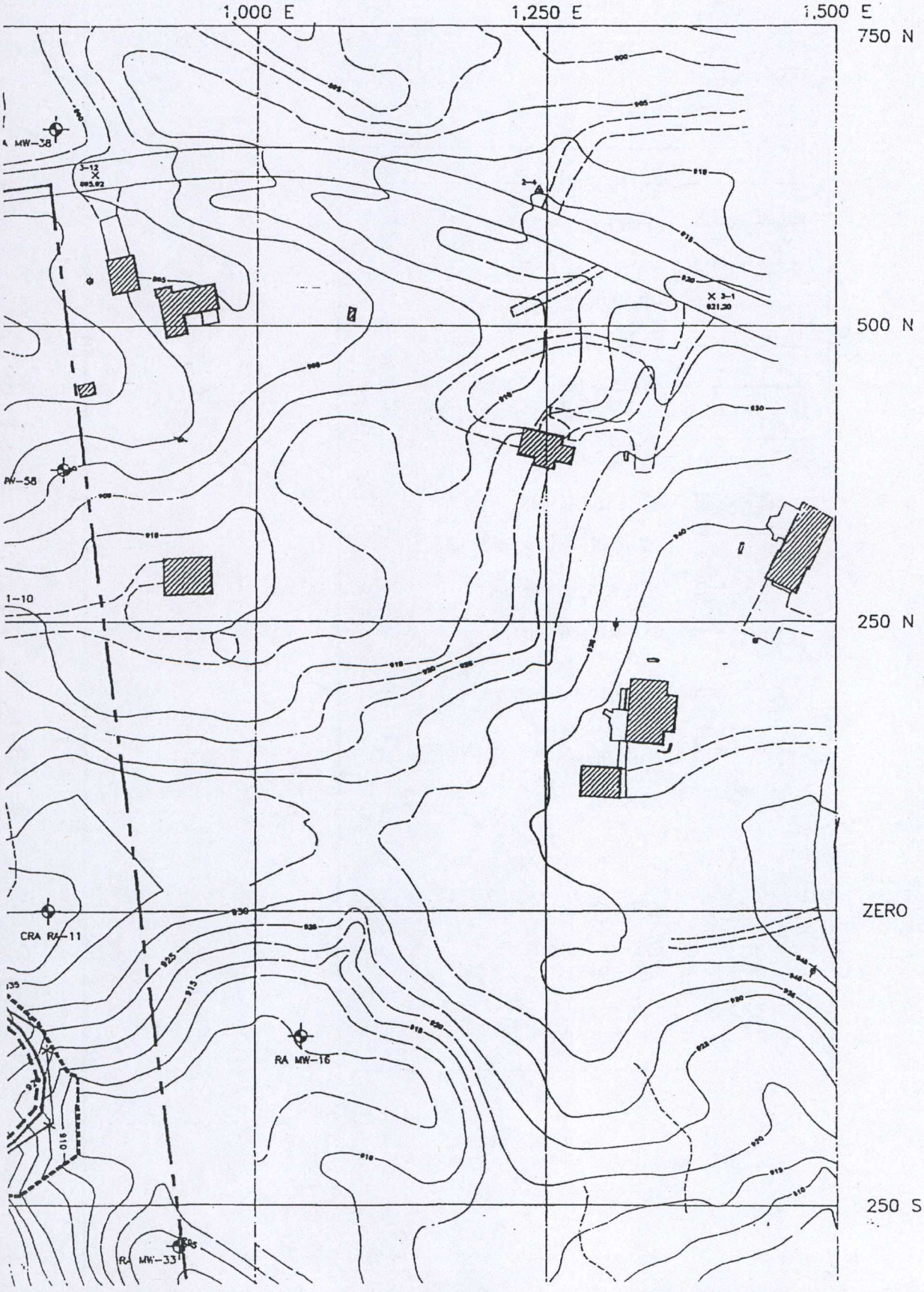

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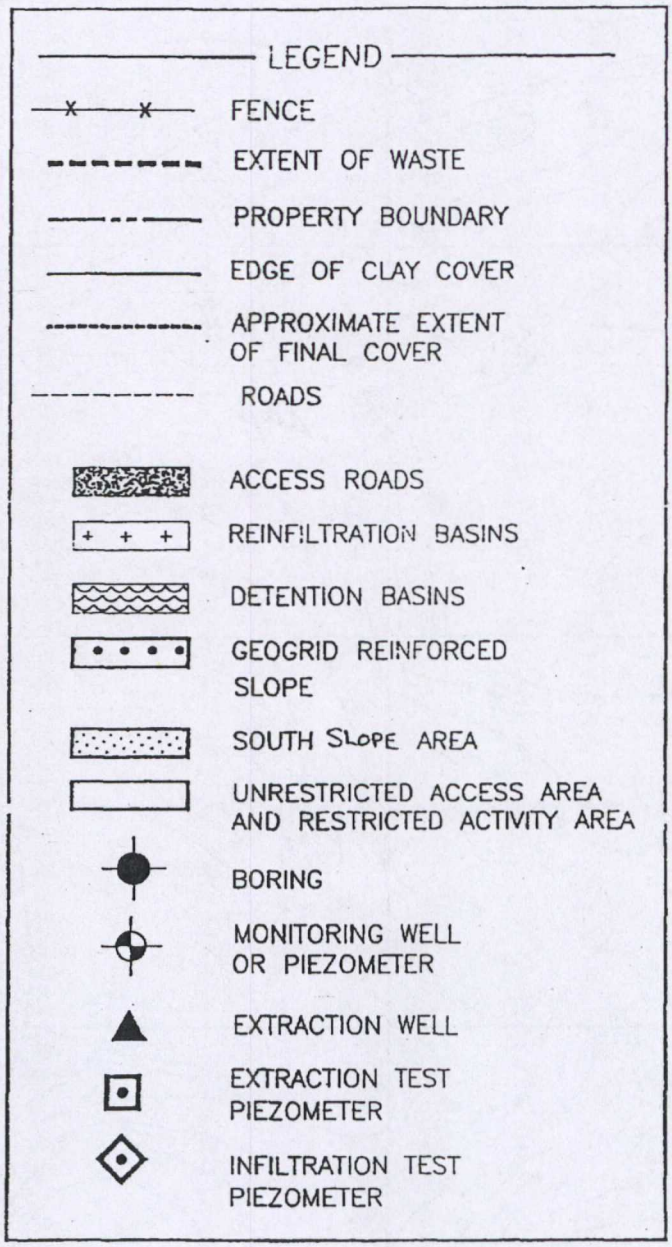

SITE

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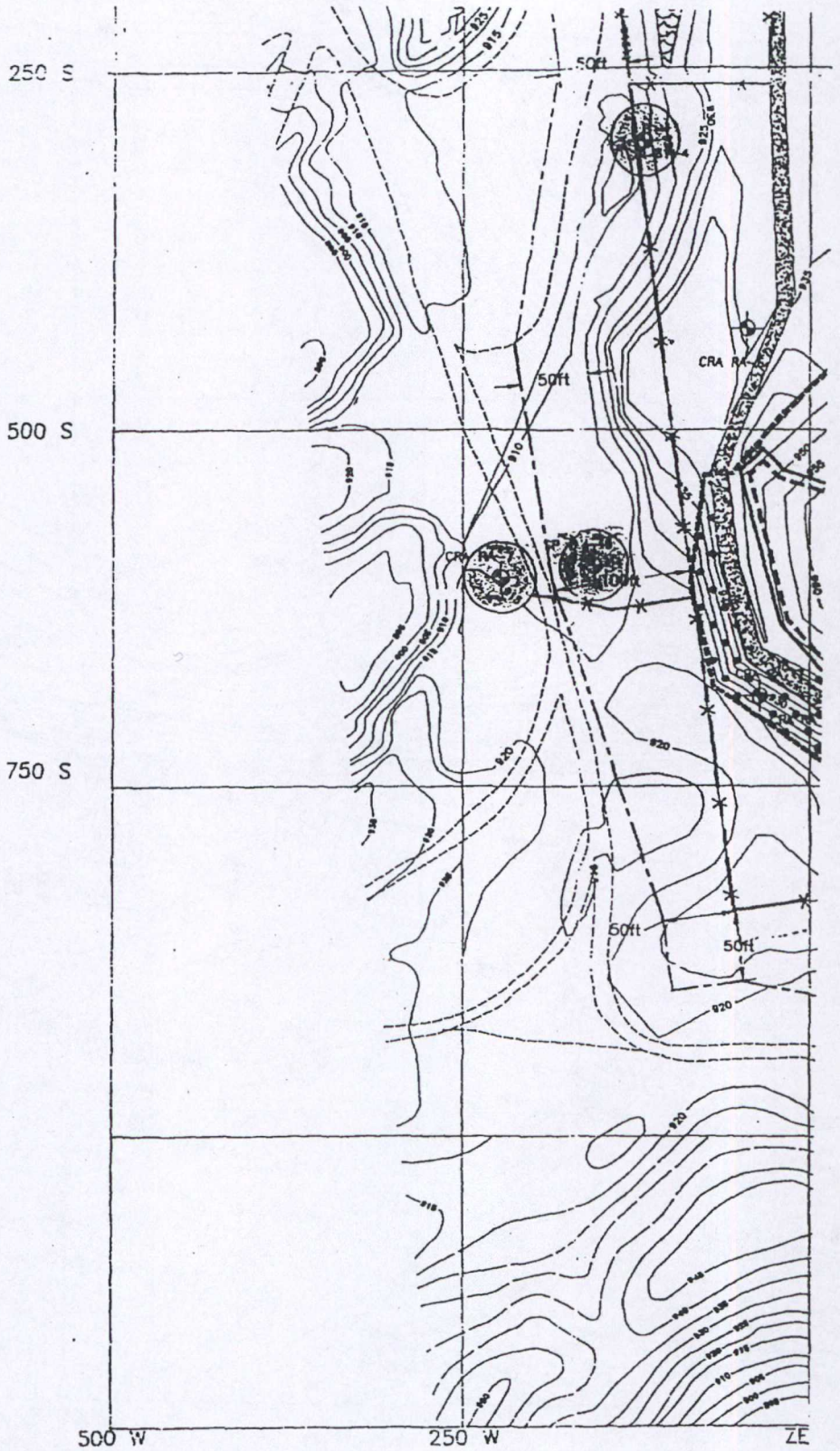

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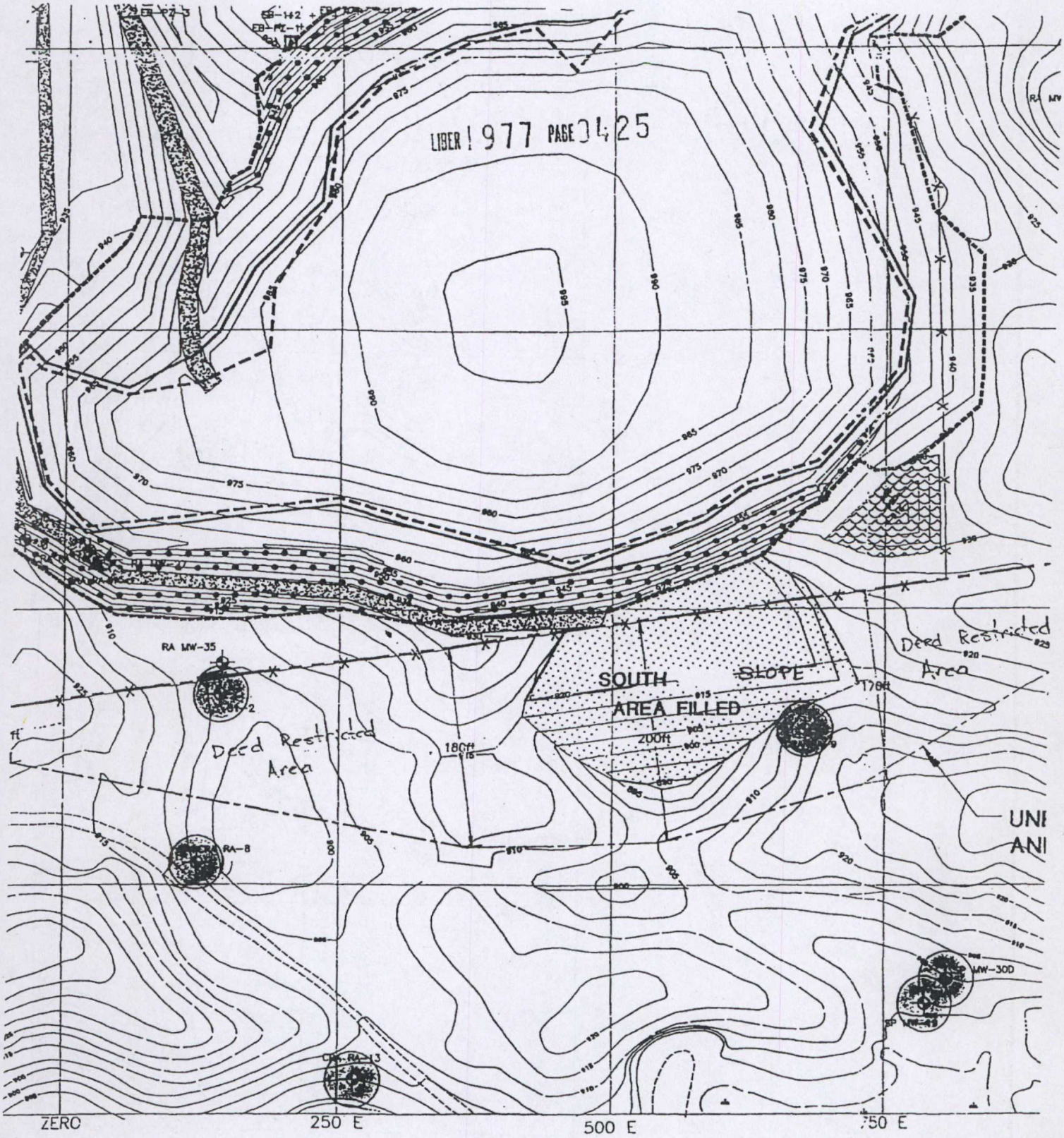

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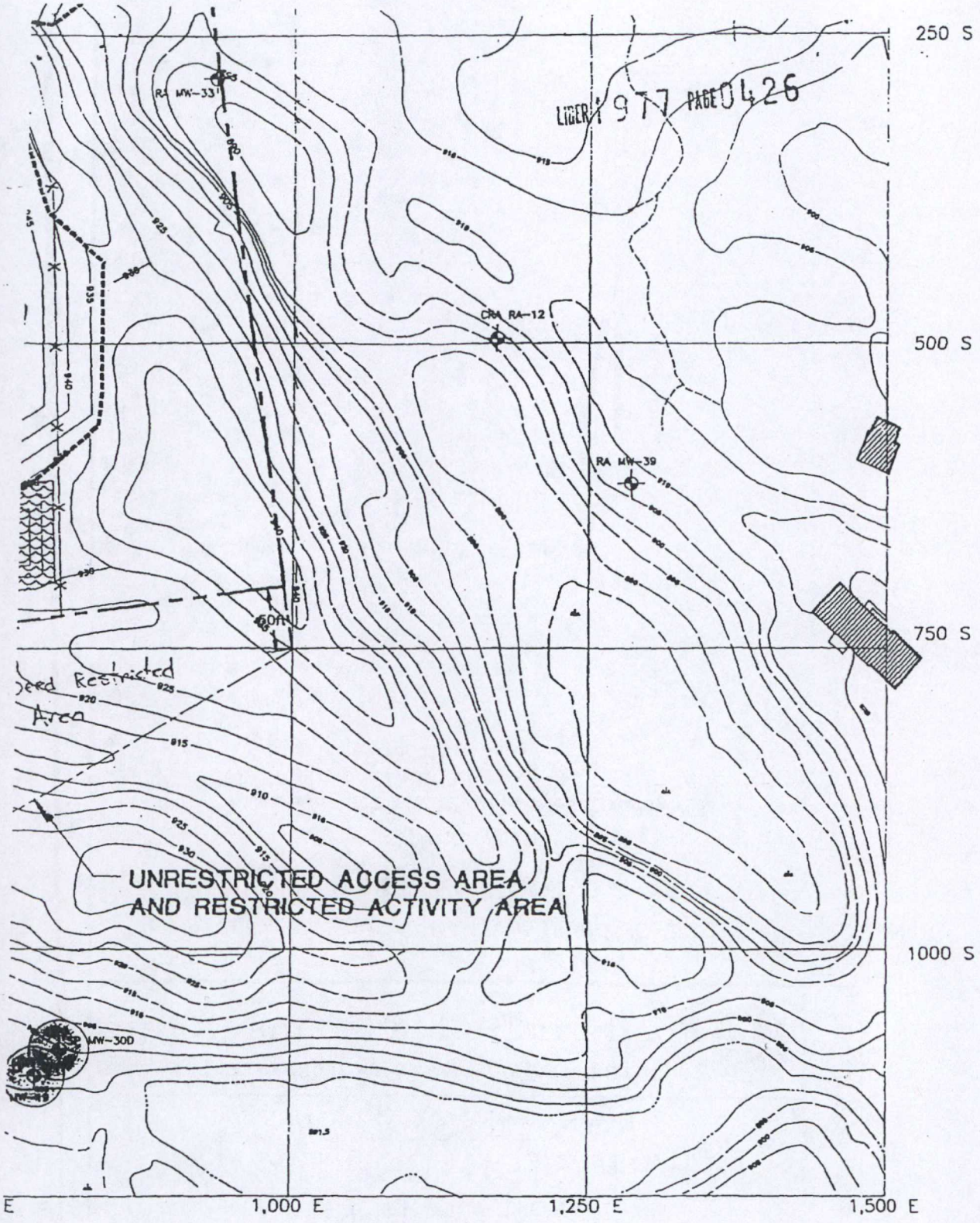

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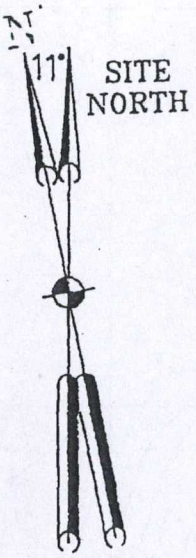

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SCALE IN FEET

CONTOUR INTERVAL 5 ft

DATE OF PHOTOGRAPHY NOVEMBER 19, 1992

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Woodward-Clyde Consultants

ENGINEERS, GEOLOGISTS, AND ENVIRONMENTAL SCIENTISTS

RASMUSSEN SITE
LIVINGSTON COUNTY, MI
SPIEGELBERG
ACCESS AGREEMENT

DESIGN: SA	CHK'D:	PROJECT NO.	FIG. NO.
DRAWN: DAS	DATE: 3-2-95	92C3548	A

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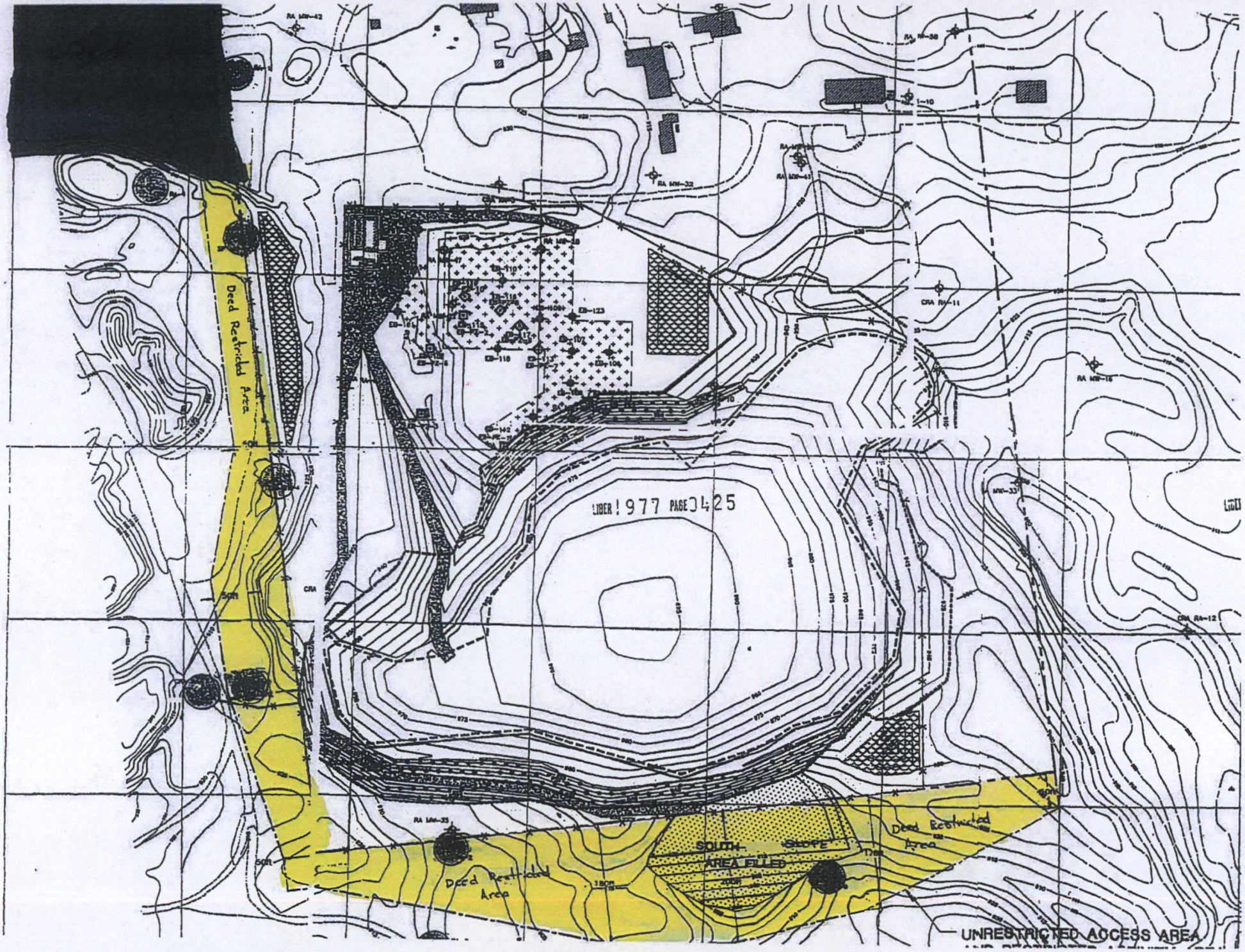
EXHIBIT "A"


Deed Restricted Area
LIBER 1977 PAGE 425
SOUTH SLOPE AREA FILLED
Deed Restricted Area
Deed Restricted Area
UNRESTRICTED ACCESS AREA

Attachment C

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF:
SR-6J

May 23, 2014

Keith Krawczyk
Senior Project Manager
Michigan Department of Environmental Quality
Site Assessment and Site Management Unit
Constitution Hall
5th Floor South
P.O. Box 30426
Lansing, MI 48909-7926

Re: Notification of Five Year Review Start for the Rasmussen's Dump Superfund Site

Dear Mr. Krawczyk:

This letter is to confirm that U.S. EPA Region 5 (EPA) and the Michigan Department of Environmental Quality (MDEQ) have begun the process of the Five Year Review for the Rasmussen's Dump Superfund Site (Rasmussen). EPA will lead the Rasmussen Five Year Review. A Statutory Five Year Review will be conducted at the site as required by Section 121 of CERCLA, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA).

The Five Year Review for Rasmussen is due on March 30, 2015 and since there are several topics to be covered in the Review, it is appropriate that EPA and MDEQ provide key parties with at least a six month notification so that we can begin the necessary coordination activities. Necessary activities include such matters as notifying the public of the Five Year Review process and accepting public input, gathering data in order to summarize performance of the cleanup, arranging for site visits, and develop any pertinent recommendations, etc. I will contact you in the near future to schedule the site visit.

If you have any questions, please feel free to contact me at 312 353 9685 or via email at caine.howard@epa.gov.

Sincerely,

Howard Caine
Remedial Project Manager
U.S. EPA Region 5

cc: B. Eleder, Five Year Review Coordinator (SR-6J), via email
K. Adler, Section Chief (SR-6J), via email
T. Jones, Community Involvement Coordinator (SM-5J), via email
C. Kawakami, Associate Regional Counsel (C-14J), via email
S. Nadeau, Honigman, Miller, Schwartz and Cohn LLP
M. Stoelton, Johnson Controls, Inc.
J. Bartholomy, CRA

Attachment D

United States Environmental Protection Agency
Region 5
77 West Jackson Boulevard
Chicago, Illinois 60604

Date: September 16, 2014

Site Visit: Rasmussen's Dump, Spicer Road, Brighton (Green Oak Township), Michigan 48116

From: Howard Caine, RPM

To: File

Introduction and Purpose

The United States Environmental Protection Agency (U.S. EPA) Region 5 conducted a Site Visit as part of the Five-Year Review at Rasmussen's Dump. The Site was toured and paperwork was reviewed. A meeting was also held with a representative of the Livingston County Road Commission to discuss installing groundwater monitoring wells along Spicer Road. The Site Visit took place on August 25, 2014.

Participants

Howard Caine, U.S. EPA

Keith Krawcyzk, Michigan Department of Environmental Quality (MDEQ)

J.R. "Bart" Bartholomy, Conestoga-Rovers & Associates (CRA)

Steve Rapai, CRA

Kim Hiller, Livingston County Road Commission

Inspection

On-Site Documents & Records Verified

The O&M Documents, Site Specific Health and Safety Plan, and O&M and OSHA Training Records were available on-site. Groundwater monitoring records are mailed to U.S. EPA and MDEQ on a quarterly basis.

O&M Costs

The O&M is performed for the PRP by CRA. O&M cost records were not available on-site, but Mr. Bartholomy estimated that the annual operating costs are approximately

$120,000. Mr. Bartholomy stated that the Site appeared to be operating normally and that there were no unanticipated or unusually high O&M costs other than the cost for replacing the lines for the ozone sparging system since the prior Five Year Review.

Access and Institutional Controls

Fencing around the Site appeared to be adequate and intact. Signs were also placed on the fence around the Site. The fence to the Site is locked.

U.S. EPA requested that the PRPs perform an Institutional Control (IC) Study at the Site and the PRPs completed it. The ICs are being updated into the form of Restrictive Covenants. U.S. EPA and MDEQ are reviewing the draft documents.

There was no evidence of vandalism or trespassing; land use changes on-site; and land use changes off-site.

General Site Conditions

The roads appeared to be maintained. The Site appeared to be in adequate shape. One sparge point had settled on the south side of the landfill and needed filling in.

Landfill Covers

Landfill Surface
There was no evidence of settlement, cracking, erosion, holes, bulges, water damage or slope instability in the landfill cover. The landfill cover is comprised of grass.

Benches
The landfill does not have benches.

Letdown Channels
The letdown channel had no evidence of settlement, degradation, erosion, undercutting, obstructions or excessive growth.

Cover Penetrations

Gas Vents
The Site has passive gas vents. The gas vents were sampled initially, but after review of the low emissions from the vents, the gas vents were no longer required to be sampled.

Monitoring Wells
The monitoring wells that were observed were properly locked and secured, are routinely sampled and were in good condition.

Gas Collection and Treatment
This Site does not have a gas collection and treatment system.

Cover Drainage Layer
The cover drainage layer has functioning outlet rock. The outlet rock is inspected.

Detention/Sedimentation Ponds
There was no evidence of siltation or erosion.

Retaining Walls
This Site does not have retaining walls.

Perimeter Ditches/Off-Site Discharge
This Site does not have perimeter ditches or off-site discharge

Vertical Barrier Walls

This Site does not have vertical barrier walls.

Groundwater/Surface Water Remedies

The pump and treat system was shutdown in early 2000.

The groundwater is being treated with an Ozone/Oxygen Sparging System. The ozone/oxygen sparging system consists of an air compressor, oxygen concentrator, ozone generator (ozone generated by super high voltage), a distribution panel and more distribution valves in front of the treatment plant. The system is in good condition. The sampling ports are properly marked and functional and the equipment was properly identified. The electrical enclosures and panels appeared to be in good condition. The treatment building also appeared to be in good condition.

Monitoring Data

The monitoring data is routinely submitted on-time and is of acceptable quality. The groundwater suggests that the groundwater plume is effectively contained and that the contaminants, in general, are declining or remaining stable.

Attachments
Five-Year Review Site Inspection Checklist

Photo 1: Ozone Generator

Photo 2: Ozone Concentrator

Photo 3: Groundwater Monitoring Well Nest CRA-RA-26

Photo 4: Groundwater Monitoring Well CRA-RA-27

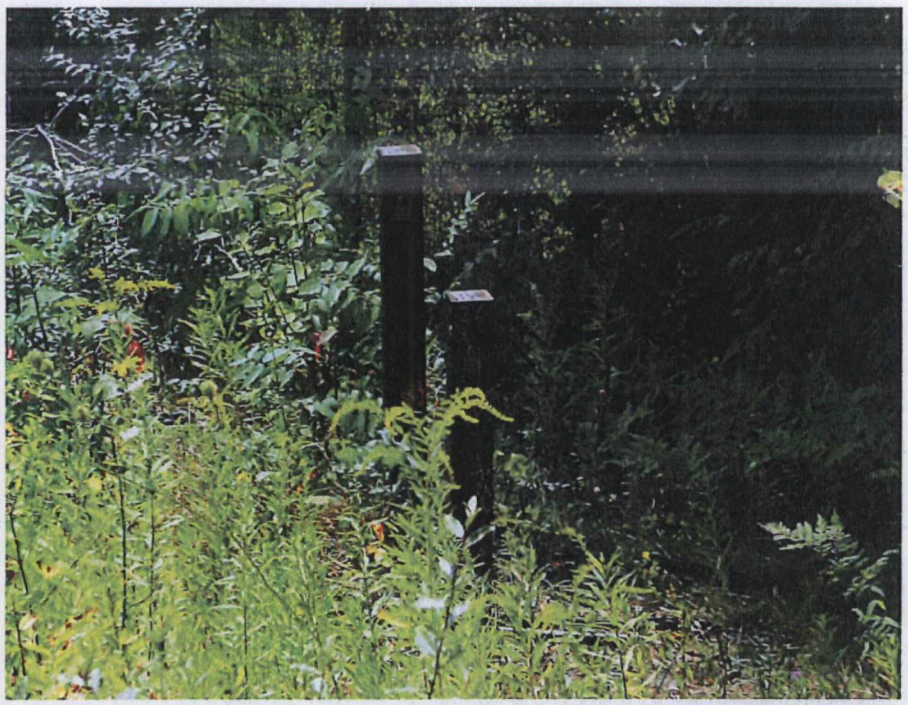


Photo 5: Groundwater Monitoring Well Nest CRA-RA-26

Photo 6: Collapsed Sparge Point to be filled

Photo 7: Path on southern end of landfill

Photo 8: Fencing along southern end of landfill

Photo 9: Path along the southern end of the landfill

Photo 10: Fencing and slope along southern end of landfill

Photo 11: Passive gas vents on top of landfill

Photo 12: Passive gas vent on top of landfill

Photo 11: Top of landfill overlooking NPL Deleted Spiegelberg Superfund site

Photo 12: Rasmussen's Dump Ozone Sparging Building

Photo 13: Top of landfill overlooking Rasmussen property

Photo 14: Warning sign posted on fence

Photo 15: South side of Spicer Road facing west

Photo 16: South side of Spicer Road facing west

Photo 17: Spicer Road facing west

Photo 18: South side of Spicer Road facing east

Photo 19: Spicer Road facing east

Photo 20: North side of Spicer Road facing east

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: RASMUSSEN'S DUMP	**Date of inspection:** 8/25/14
Location and Region: BRIGHTON, MI/REGION 5	**EPA ID:** MID 095 402 210
Agency, office, or company leading the five-year review: U.S. EPA	**Weather/temperature:** PARTLY CLOUDY, TEMP ~85°F

Remedy Includes: (Check all that apply)

- ✓ Landfill cover/containment
- ✓ Access controls
- ✓ Institutional controls
- Groundwater pump and treatment
- Surface water collection and treatment
- Other _____
- Monitored natural attenuation
- Groundwater containment
- Vertical barrier walls

Attachments: Inspection team roster attached Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** _____ _____ _____
   Name Title Date
   Interviewed at site at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

2. **O&M staff** _____ _____ _____
   Name Title Date
   Interviewed at site at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

J. R. "BART" BARTHOLOMY, CRA
STEVE RAMAI, CRA
KIM HILLER, LIVINGSTON COUNTY ROAD COMISSION
KEITH KRAWCZYK, MDEQ
HOWARD CAINE, EPA

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____

4. **Other interviews** (optional) Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - O&M manual — Readily available ✓ — Up to date — N/A
   - As-built drawings — Readily available ✓ — Up to date — N/A
   - Maintenance logs — Readily available ✓ — Up to date — N/A

   Remarks_____

2. **Site-Specific Health and Safety Plan** — Readily available ✓ — Up to date — N/A
   - Contingency plan/emergency response plan — Readily available ✓ — Up to date — N/A

   Remarks_____

3. **O&M and OSHA Training Records** — Readily available ✓ — Up to date — N/A

   Remarks_____

4. **Permits and Service Agreements**
   - Air discharge permit — Readily available — Up to date — N/A
   - Effluent discharge — Readily available — Up to date — N/A
   - Waste disposal, POTW — Readily available — Up to date — N/A
   - Other permits_____ — Readily available — Up to date — N/A

   Remarks_____

5. **Gas Generation Records** — Readily available — Up to date — N/A

   Remarks_____

6. **Settlement Monument Records** — Readily available — Up to date — N/A

   Remarks_____

7. **Groundwater Monitoring Records** — Readily available ✓ — Up to date — N/A

   Remarks_____

8. **Leachate Extraction Records** — Readily available — Up to date — N/A

   Remarks_____

9. **Discharge Compliance Records**
   - Air — Readily available — Up to date — N/A
   - Water (effluent) — Readily available — Up to date — N/A

   Remarks_____

10. **Daily Access/Security Logs** — Readily available — Up to date — N/A

    Remarks_____

IV. O&M COSTS

1. **O&M Organization**
   State in-house — Contractor for State
   PRP in-house — Contractor for PRP ✓
   Federal Facility in-house — Contractor for Federal Facility
   Other_____

2. **O&M Cost Records** PRP LEAD, DO NOT NEED TO PROVIDE
   Readily available — Up to date
   Funding mechanism/agreement in place
   Original O&M cost estimate_____ Breakdown attached

   Total annual cost by year for review period if available

   From_____ To_____ _____ Breakdown attached
   Date — Date — Total cost
   From_____ To_____ _____ Breakdown attached
   Date — Date — Total cost
   From_____ To_____ _____ Breakdown attached
   Date — Date — Total cost
   From_____ To_____ _____ Breakdown attached
   Date — Date — Total cost
   From_____ To_____ _____ Breakdown attached
   Date — Date — Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
   Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS — Applicable — N/A

A. Fencing

1. **Fencing damaged** — Location shown on site map — Gates secured ✓ — N/A
   Remarks_____

B. Other Access Restrictions

1. **Signs and other security measures** ✓ — Location shown on site map — N/A
   Remarks_____

C. Institutional Controls (ICs)

1. **Implementation and enforcement** DEED RESTRICTIONS ARE IN-PLACE FOR PERIOD AREA.

Site conditions imply ICs not properly implemented Yes No N/A
Site conditions imply ICs not being fully enforced Yes No N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____
Frequency _____
Responsible party/agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.

Reporting is up-to-date Yes No N/A
Reports are verified by the lead agency Yes No N/A

Specific requirements in deed or decision documents have been met Yes No N/A
Violations have been reported Yes No N/A
Other problems or suggestions: Report attached

_____
_____
_____
_____

2. **Adequacy** ICs are adequate ICs are inadequate N/A
Remarks DEED RESTRICTIONS ARE BEING UPDATED TO RESTRICTIVE COVENANTS
_____
_____

D. General

1. **Vandalism/trespassing** Location shown on site map No vandalism evident ✓
Remarks _____
_____

2. **Land use changes on site** N/A ✓
Remarks _____
_____

3. **Land use changes off site** N/A ✓
Remarks _____
_____

VI. GENERAL SITE CONDITIONS

A. Roads Applicable N/A

1. **Roads damaged** Location shown on site map Roads adequate ✓ N/A
Remarks _____
_____

B. Other Site Conditions

Remarks_____

_____

_____

_____

_____

_____

VII. LANDFILL COVERS Applicable N/A

A. Landfill Surface

1. **Settlement** (Low spots) Location shown on site map Settlement not evident ✓
   Areal extent_____ Depth_____
   Remarks_____
   _____

2. **Cracks** Location shown on site map Cracking not evident ✓
   Lengths_____ Widths_____ Depths_____
   Remarks_____
   _____

3. **Erosion** Location shown on site map Erosion not evident ✓
   Areal extent_____ Depth_____
   Remarks_____
   _____

4. **Holes** Location shown on site map Holes not evident ✓
   Areal extent_____ Depth_____
   Remarks_____
   _____

5. **Vegetative Cover** Grass Cover properly established No signs of stress ✓
   Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____
   _____

6. **Alternative Cover (armored rock, concrete, etc.)** N/A
   Remarks_____
   _____

7. **Bulges** Location shown on site map Bulges not evident ✓
   Areal extent_____ Height_____
   Remarks_____
   _____

8. **Wet Areas/Water Damage** — Wet areas/water damage not evident ✓
   - Wet areas — Location shown on site map — Areal extent_____
   - Ponding — Location shown on site map — Areal extent_____
   - Seeps — Location shown on site map — Areal extent_____
   - Soft subgrade — Location shown on site map — Areal extent_____

   Remarks_____

9. **Slope Instability** — Slides — Location shown on site map — No evidence of slope instability ✓
   Areal extent_____
   Remarks_____

B. Benches — Applicable — N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** — Location shown on site map — N/A or okay
   Remarks_____

2. **Bench Breached** — Location shown on site map — N/A or okay
   Remarks_____

3. **Bench Overtopped** — Location shown on site map — N/A or okay
   Remarks_____

C. Letdown Channels — Applicable — N/A

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** — Location shown on site map — No evidence of settlement
   Areal extent_____ Depth_____
   Remarks_____

2. **Material Degradation** — Location shown on site map — No evidence of degradation
   Material type_____ Areal extent_____
   Remarks_____

3. **Erosion** — Location shown on site map — No evidence of erosion
   Areal extent_____ Depth_____
   Remarks_____

4. **Undercutting** Location shown on site map No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ No obstructions
Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
No evidence of excessive growth
Vegetation in channels does not obstruct flow
Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations Applicable N/A

1. **Gas Vents** Active Passive ✓
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance
N/A
Remarks_____

2. **Gas Monitoring Probes**
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
Properly secured/locked ✓ Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

4. **Leachate Extraction Wells**
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

5. **Settlement Monuments** Located Routinely surveyed N/A
Remarks_____

E. Gas Collection and Treatment Applicable (N/A)

1. **Gas Treatment Facilities**
   Flaring Thermal destruction Collection for reuse
   Good condition Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   Good condition Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   Good condition Needs Maintenance N/A
   Remarks_____

F. Cover Drainage Layer Applicable N/A

1. **Outlet Pipes Inspected** Functioning N/A
   Remarks_____

2. **Outlet Rock Inspected** Functioning N/A
   Remarks_____

G. Detention/Sedimentation Ponds Applicable N/A

1. **Siltation** Areal extent_____ Depth_____ N/A
   Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   Erosion not evident
   Remarks_____

3. **Outlet Works** Functioning N/A
   Remarks_____

4. **Dam** Functioning N/A
   Remarks_____

H. Retaining Walls Applicable N/A

1. **Deformations** Location shown on site map Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** Location shown on site map Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge Applicable N/A

1. **Siltation** Location shown on site map Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** Location shown on site map N/A
   Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** Location shown on site map Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** Functioning N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS Applicable (N/A)

1. **Settlement** Location shown on site map Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   Performance not monitored
   Frequency_____ Evidence of breaching
   Head differential_____
   Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES	Applicable	N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines Applicable N/A

OBLE SPARGING SYSTEM

1. **Pumps, Wellhead Plumbing, and Electrical**
   Good condition ✓ All required wells properly operating Needs Maintenance N/A
   Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition ✓ Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   Readily available ✓ Good condition Requires upgrade Needs to be provided
   Remarks_____

B. Surface Water Collection Structures, Pumps, and Pipelines Applicable (N/A)

1. **Collection Structures, Pumps, and Electrical**
   Good condition Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks_____

C. Treatment System Applicable N/A

1. **Treatment Train** (Check components that apply)
   - Metals removal — Oil/water separation — Bioremediation
   - Air stripping — Carbon adsorbers
   - Filters_____
   - Additive (*e.g.*, chelation agent, flocculent)_____
   - Others_____
   - Good condition — Needs Maintenance
   - Sampling ports properly marked and functional
   - Sampling/maintenance log displayed and up to date
   - Equipment properly identified
   - Quantity of groundwater treated annually_____
   - Quantity of surface water treated annually_____

   Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   N/A — Good condition — Needs Maintenance

   Remarks_____

3. **Tanks, Vaults, Storage Vessels**
   N/A — Good condition — Proper secondary containment — Needs Maintenance

   Remarks_____

4. **Discharge Structure and Appurtenances**
   N/A — Good condition — Needs Maintenance

   Remarks_____

5. **Treatment Building(s)**
   N/A — Good condition (esp. roof and doorways) — Needs repair
   Chemicals and equipment properly stored

   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
   Properly secured/locked — Functioning — Routinely sampled — Good condition
   All required wells located — Needs Maintenance — N/A

   Remarks_____

D. Monitoring Data

1. Monitoring Data
   Is routinely submitted on time ✓ — Is of acceptable quality

2. Monitoring data suggests:
   Groundwater plume is effectively contained ✓ — Contaminant concentrations are declining ✓

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
   Properly secured/locked Functioning Routinely sampled Good condition
   All required wells located Needs Maintenance (N/A)
   Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

SEE 5YR REPORT

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

SEE 5YR REPORT

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D.	Opportunities for Optimization
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Attachment E

EPA Begins Review of Rasmussen's Dump Superfund Site

Brighton, Michigan

U.S. Environmental Protection Agency is conducting a five-year review of the Rasmussen's Dump Superfund site at 9040 Spicer Road in Brighton. The Superfund law requires regular checkups of sites that have been cleaned up – with waste managed on-site – to make sure the cleanup continues to protect people and the environment.

EPA's cleanup of contamination at the dumpsite included an on-site cover, ozone treatment system, pump-and-treat system for groundwater, long-term monitoring and limits on use of the site and site access.

More information is available at the Hamburg Township Library, 10411 Merrill Road in Whitmore Lake and the Brighton District Library, 100 Library Drive in Brighton, and at www.epa.gov/region05/cleanup/rassmussen/index.html. The review should be completed by the end of March 2015.

The five-year review is an opportunity for you to tell EPA about site conditions and any concerns you have. Contact:

Howard Caine
Remedial Project Manager
312-353-9685
caine.howard@epa.gov

Teresa Jones
Community Involvement Coordinator
312-886-0725
jones.teresa@epa.gov

You may also call EPA toll-free at 800-621-8431, 9:30 a.m. to 5:30 p.m., weekdays.

(07-27-2014 DAILY 205685)

Attachment F

Northern Plume Monitoring Wells with Groundwater Monitoring Results

Monitoring Wells: CRA-RA-22, CRA-RA-24, CRA-RA-25 (Q3 only), 81-8, TEMP-PZ-2, CRA-RA-28, CRA-RA-29, CRA-RA-30, CRA-RA-32

Mon Well	Cont	GW Standard	3/17/2010	6/10/2010	9/1/2010	12/7/2010	3/9/2011	6/13/2011	8/19/2011	12/7/2011
CRA-RA-22	VC	2 ppb	8.4	5.7	5.4	6.1	3.8	7.8	5.7	7.6 / 7.8
			3/14/2012	5/24/2012	9/14/2012	12/5/2012	3/22/2013	6/13/2013	8/21/2013	11/11/2013
			6.7	8.2	7.3	8.9	12	9.0	7.4	8.5 / 8.4
			3/13/2014	6/11/2014	8/19/2014	12/11/2014				
			7.8	4.2	5.6	4.0				
CRA-RA- 24	VC	2 ppb	3/16/2010	6/9/2010	8/27/2010	12/7/2010	3/8/2011	3/8/11 Dup	6/9/2011	8/18/2011
			3.1	2.7	2.9	2.7	4.2	4.3	4	3.3
			12/13/2011	3/14/2012	5/23/2012	9/13/2012	12/5/2012	3/22/2013	6/11/2013	8/16/2013
			3.9	4.5	4.4	3.5	5.3 / 5.6	7.4	7.5	5
			11/7/2013	4/8/2014	6/11/2014	8/18/2014	12/9/2014			
			6.5	6.2	5.2	6.0	5.3			
CRA-RA-25	Benz	5 ppb	*Met Standard since May 2001*							
81-8	VC	2 ppb	*Met Standard since December 2009*							
TEMP-PZ-2	VC	2 ppb	*All data has met applicable groundwater standards*							
CRA-RA-28	VC	2 ppb	*All data has met applicable groundwater standards except for*					3/10/2010		
								2.1		
CRA-RA-29	VC	2 ppb	*All data has met applicable groundwater standards*							
CRA-RA-30	VC	2 ppb	3/16/2010	6/10/2010	8/27/2010	12/7/2010	3/9/2011	6/10/2011	8/18/2011	12/8/2011
			2.9	1.8	2.1	3	5.8	5.5	4.5	4.2
			3/14/2012	5/24/2012	9/13/2012	12/5/2012	3/22/2013	6/11/2013	8/16/2013	11/11/2013
			5.0	5.9	3.5	4.2	5.6	4.5	3.3	4.5
			4/8/2014	6/11/2014	8/18/2014	12/10/2014				
			4.5	3.1	3.6	3.3				
CRA-RA-32	VC	2 ppb	*Met Standard since March 2008*							
PZ-104*	VC	2 ppb	*Met Standard since March 2008*							

*EW-104 corresponds with PZ-104

PDSLD Plume Monitoring Wells with Groundwater Monitoring Results

Monitoring Wells: CRA-RA-2D, CRA-RA-18, RA-MW-28, PZ-106, EB-PZ-4

Mon Well	Cont	GW Standard				
CRA-RA-2D	**VC**	**2 ppb**	***Met Standard since December 2009***			
RA-MW-28			***All data has met applicable groundwater standards***			
PZ-106**			***All data has met applicable groundwater standards***			
EB-PZ-4***			***All data has met applicable groundwater standards except for***	**9/10/2012**	**12/4/2012**	**8/27/2013**
				3.3	4.0	2.2
CRA-RA-18			***All data has met applicable groundwater standards***			

**EW-106 corresponds with PZ-106 and had results of chlorobenzene, 120 ppb [100 ppb limit]; ethylbenzene 110 ppb [74 ppb limit]; and xylenes (total) 357 ppb [280 ppb limit] on 12/15/1999

***EW-101 corresponds with EB-PZ-4 and had results of chlorobenzene 190 ppb [100 ppb limit]; benzene 8 [5.0 std]; ethylbenzene 96 ppb [74 ppb limit]; and vinyl chloride 3 ppb [2.0 limit] on 11/11/1999

Landfill Monitoring Program

Monitoring Wells: CRA-RA-8, CRA-RA-18, CRA-RA-19S, CRA-RA-20, CRA-RA-6S

CRA-RA-8			***All data has met applicable groundwater standards***			
CRA-RA-18	**VC**	**2 ppb**	***All data has met applicable groundwater standards; except for***	**12/3/2010**	**6/18/2010**	
				2.1	2.3	
CRA-RA-19S			***All data has met applicable groundwater standards***			
CRA-RA-20			***All data has met applicable groundwater standards***			
CRA-RA-6S	**VC**	**2 ppb**	***All data has met applicable groundwater standards***			

CRA-RA-6S	Pb, 65.3	Total	6/14/2011
CRA-RA-18	Pb, 5.1/4.9	Dissolved	6/10/2011
CRA-RA-19S	Pb, 4.9	Dissolved	6/10/2011

Southern TCE Area Plume Monitoring Wells with Groundwater Monitoring Results

Monitoring Wells: CRA-RA-23D, CRA-RA-26D, CRA-RA-26S

Mon Well	Cont	GW Standard								
CRA-RA-23D			***All data has met applicable groundwater standards except for***					**8/24/2011**	**12/13/2011**	**3/7/2012**
								5.3	5.1	4.9
			6/21/2012	**9/11/2012**	**12/10/2012**	**3/25/2013**	**6/19/2013**	**8/28/2013**	**11/14/2013**	**4/14/2014**
			5.9	4.9	4.4	5.5	6.5	5.9	5.1	5.9
			6/19/2014							
			5.1							
CRA-RA-26D			***All data has met applicable groundwater standards***							
CRA-RA-26S	**TCE**	**5 ppb**	**3/17/2010**	**6/16/2010**	**9/7/2010**	**12/3/2010**	**3/14/2011**	**6/14/2011**	**8/23/2011**	**12/13/2011**
			100	110	130	130	139	136	155	111
			3/8/2012	**6/21/2012**	**9/11/2012**	**12/6/2012**	**3/24/2013**	**6/19/2013**	**8/27/2013**	**11/13/2013**
			117	133	100	90	97/99	110	95	95
			4/11/2014	**6/19/2014**	**9/11/2014**	**12/16/2014**				
			100	98	99	86/85				

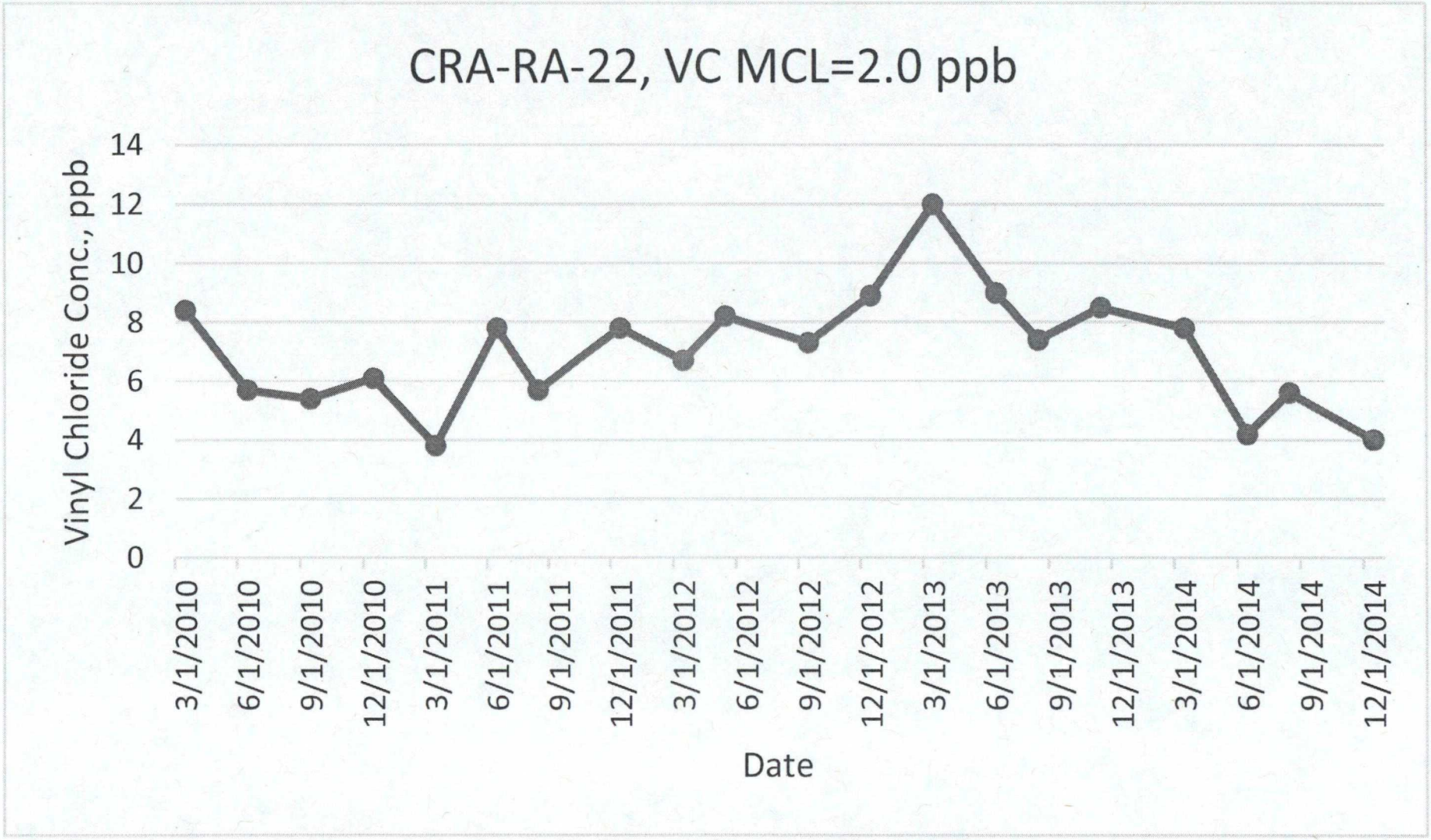
Southern Vinyl Chloride Area Plume Monitoring Wells with Groundwater Monitoring Results

Monitoring Wells: CRA-RA-27, CRA-RA-6S, CRA-RA-18, CRA-RA-5, 81-4, CRA-RA-7, CRA-RA-5, CRA-RA-31

Mon Well	Cont	GW Standard	3/17/2010	6/16/2010	9/7/2010	12/3/2010	3/4/2011	6/14/2011	8/23/2011	12/13/2011
CRA-RA-27	VC	2 ppb	16/15 Dup	12	12	10	13.2	12.2	13.3	11.8
			3/8/2012	6/20/2012	9/11/2012	12/6/2012	3/23/2013	6/19/2013	8/27/2013	11/13/2013
			8.2	12.2	13	13 / 13	17	13	12	11
			4/11/2014	6/18/2014	9/11/2014	12/16/2014				
			10	12	8.9 / 8.9	11.0				
CRA-RA-6S	VC	2 ppb	*All data has met applicable groundwater standards*							
CRA-RA-18	VC	2 ppb	*All data has met applicable groundwater standards*							
CRA-RA-5	VC	2 ppb	*All data has met applicable groundwater standards*							
81-4	VC	2 ppb	3/17/2010	6/17/2010	9/7/2010	12/2/2010	3/14/2011	6/14/2011	8/24/2011	12/13/2011
			3.3	3.0	3.7	2.9	3.5	3.5	3.6	3.1
			3/15/2012	6/20/2012	9/11/2012	12/10/2012	3/25/2013	6/19/2013	8/28/2013	11/14/2013
			3.1	3.2	3.1	3.3	3.6	2.8	2.5	2.6 / 2.5
			4/11/2014	6/19/2014	9/12/2014	12/16/2014				
			2	2.1	1.6	2.0				
CRA-RA-7			*All data has met applicable groundwater standards*							
CRA-RA-31			*All data has met applicable groundwater standards*							

Lower Aquifer Plume

RA-MW-47		*All data has met applicable groundwater standards*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Vinyl Chloride Conc., ppb
14
12
10
8
6
4
2
0
3/1/2010
6/1/2010
9/1/2010
12/1/2010
3/1/2011
6/1/2011
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9/1/2014
12/1/2014
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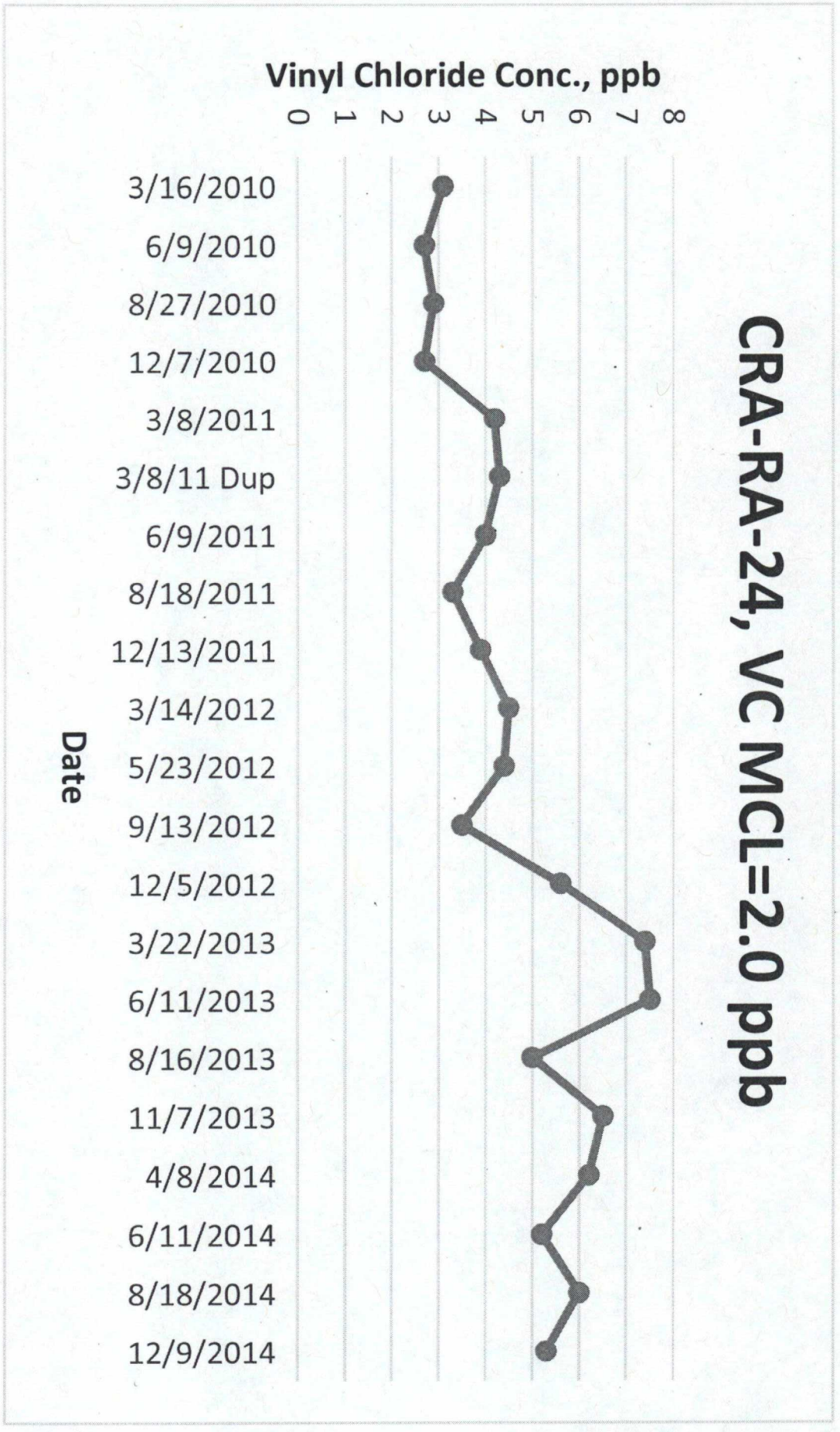
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0
1
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3
4
5
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7
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Date
3/16/2010
6/9/2010
8/27/2010
12/7/2010
3/8/2011
3/8/11 Dup
6/9/2011
8/18/2011
12/13/2011
3/14/2012
5/23/2012
9/13/2012
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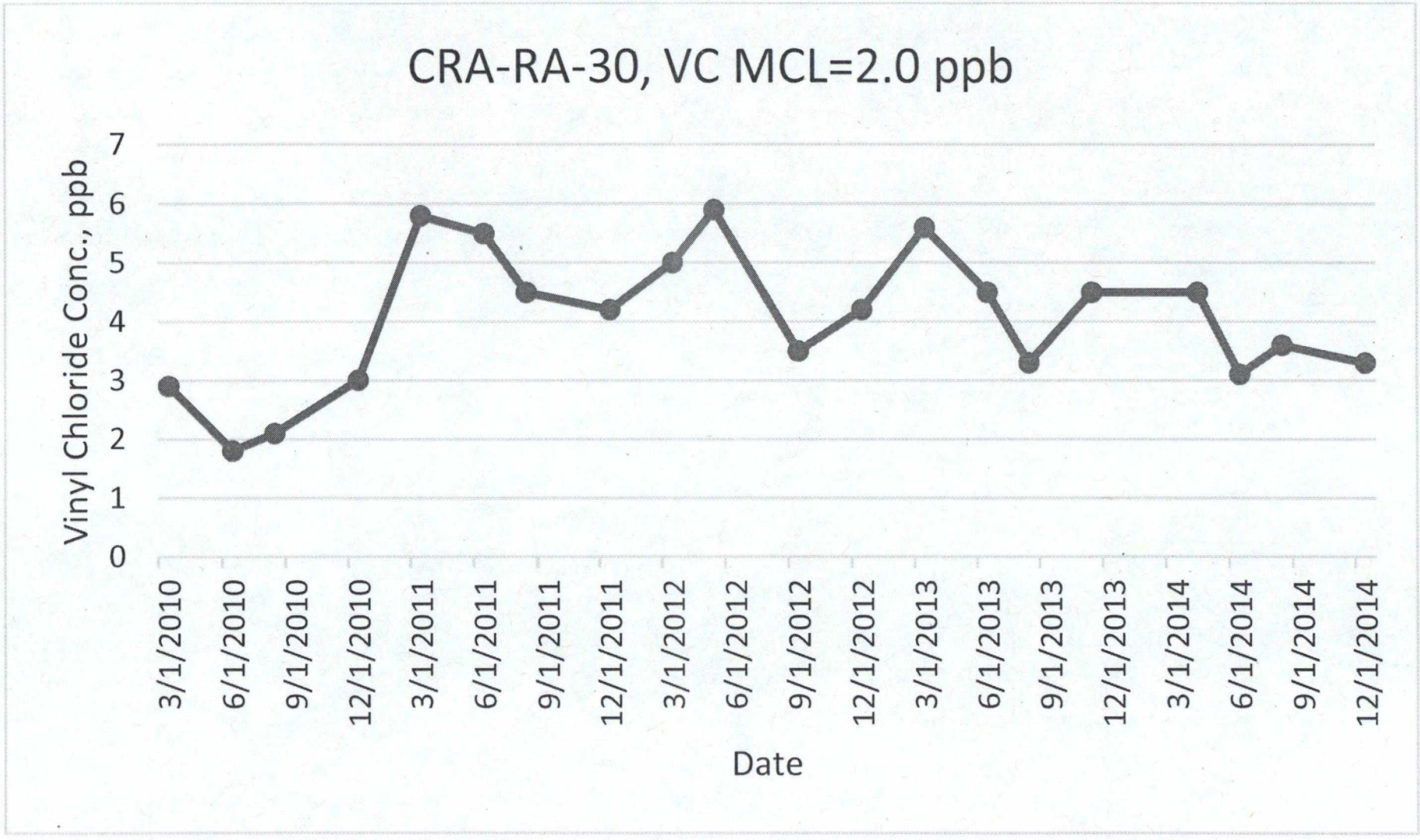
6/11/2014
8/18/2014
12/9/2014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Vinyl Chloride Conc., ppb
0
1
2
3
4
5
6
7
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9/1/2010
12/1/2010
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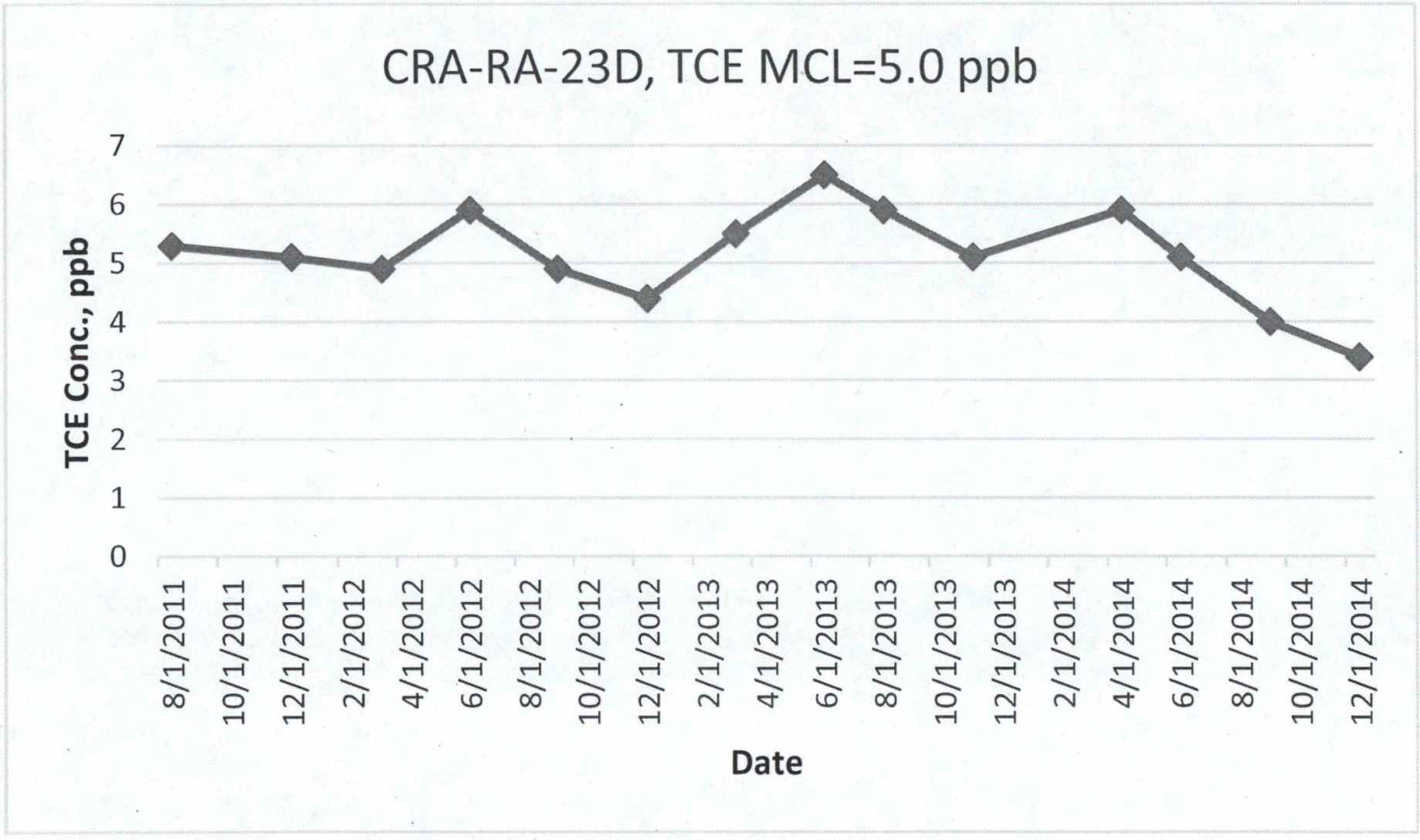
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TCE Conc., ppb
0
1
2
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5
6
7
8/1/2011
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12/1/2011
2/1/2012
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6/1/2012
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8/1/2014
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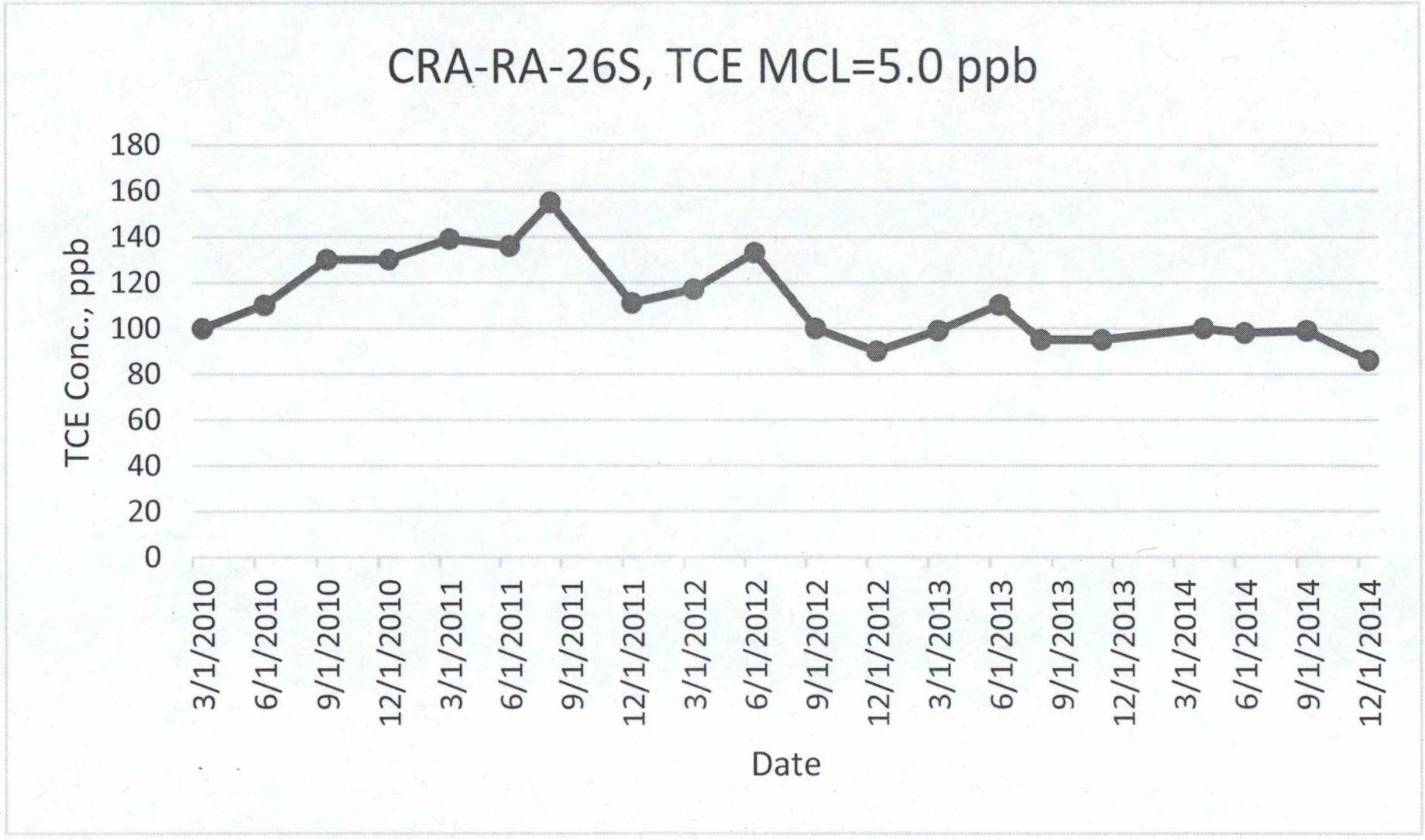
12/1/2014
Date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TCE Conc., ppb
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160
140
120
100
80
60
40
20
0
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6/1/2010
9/1/2010
12/1/2010
3/1/2011
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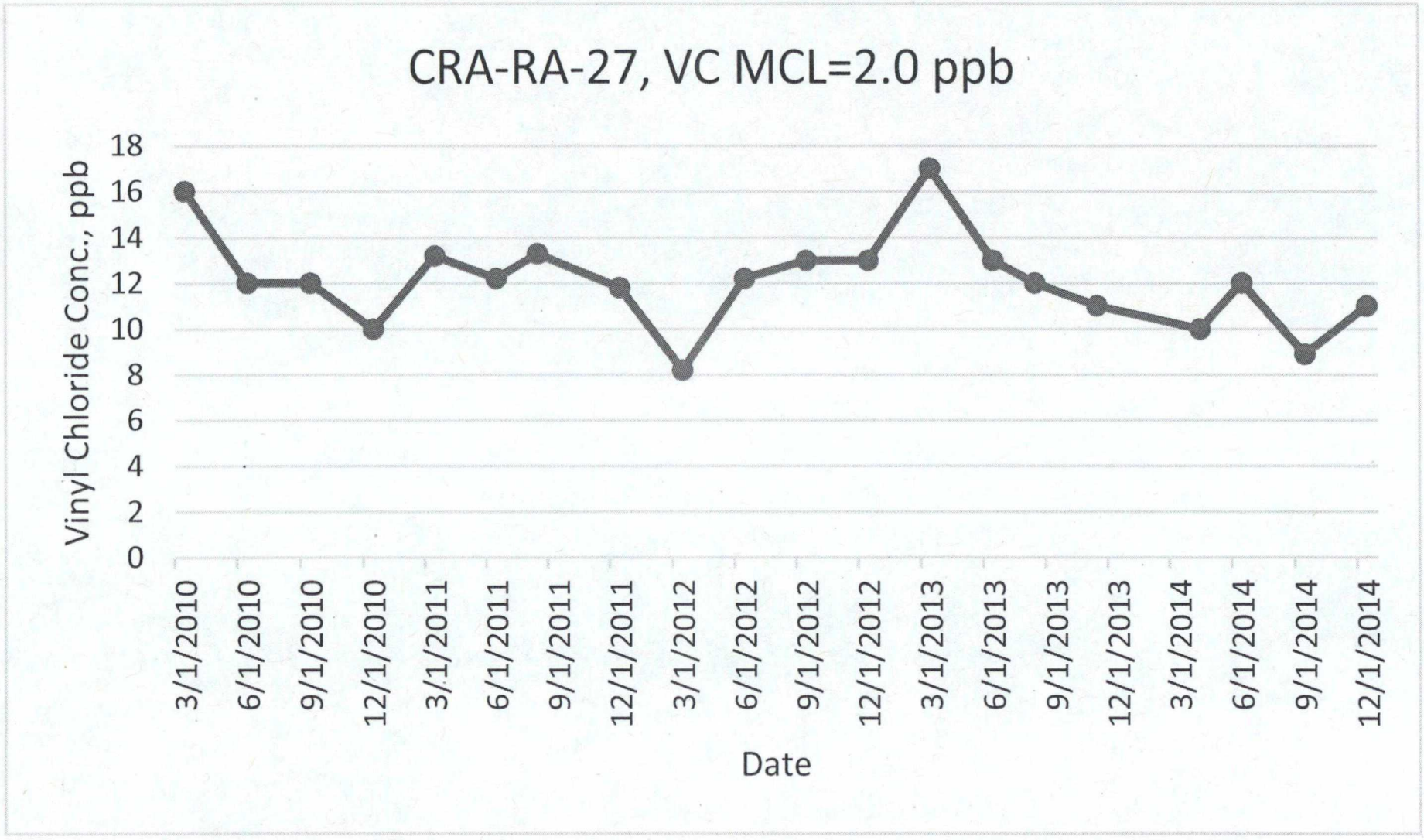
CRA-RA-27, VC MCL=2.0 ppb
Vinyl Chloride Conc., ppb
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16
14
12
10
8
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4
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0
3/1/2010
6/1/2010
9/1/2010
12/1/2010
3/1/2011
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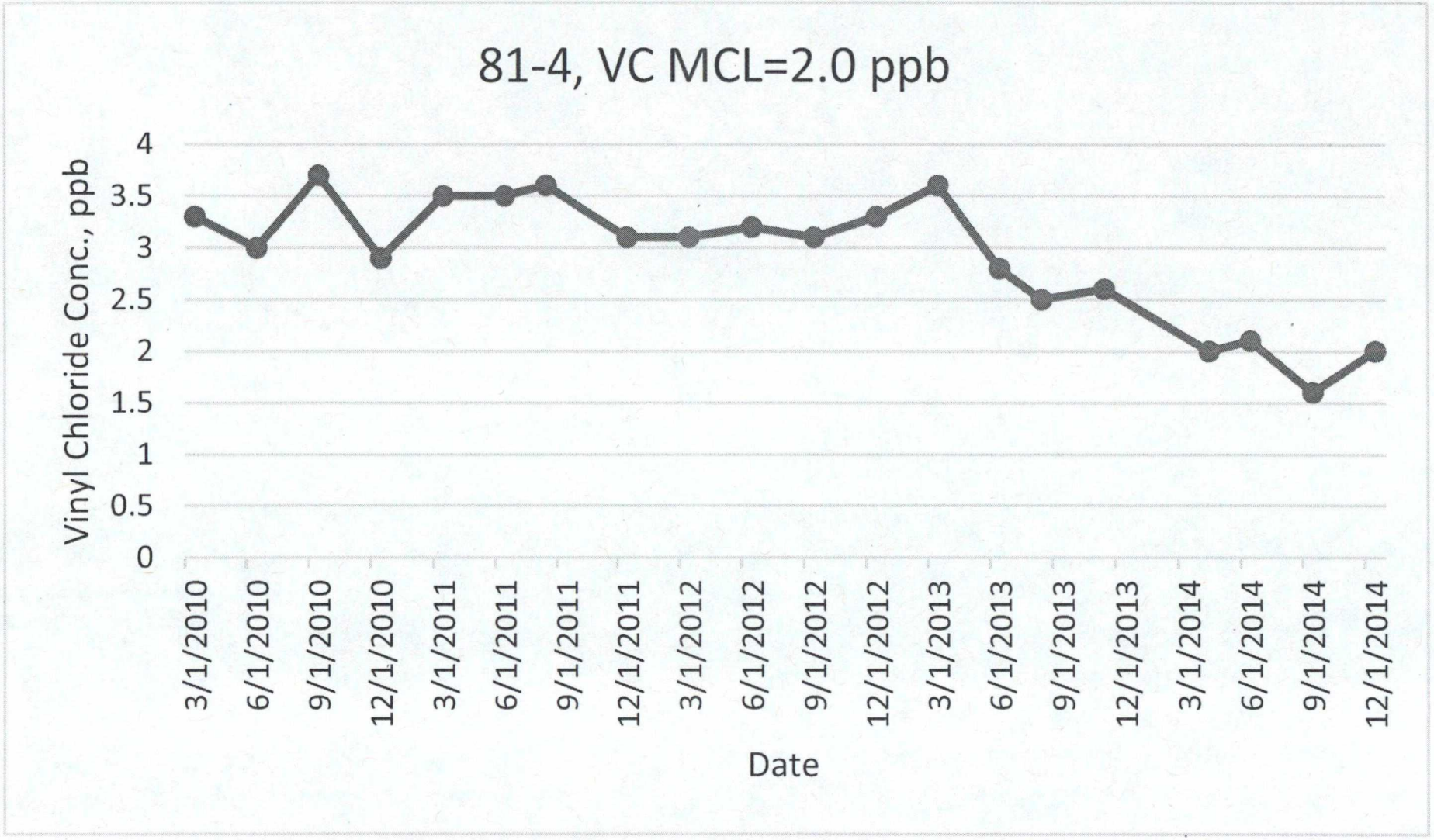
12/1/2014
Date


81-4, VC MCL=2.0 ppb
Vinyl Chloride Conc., ppb
4
3.5
3
2.5
2
1.5
1
0.5
0
3/1/2010
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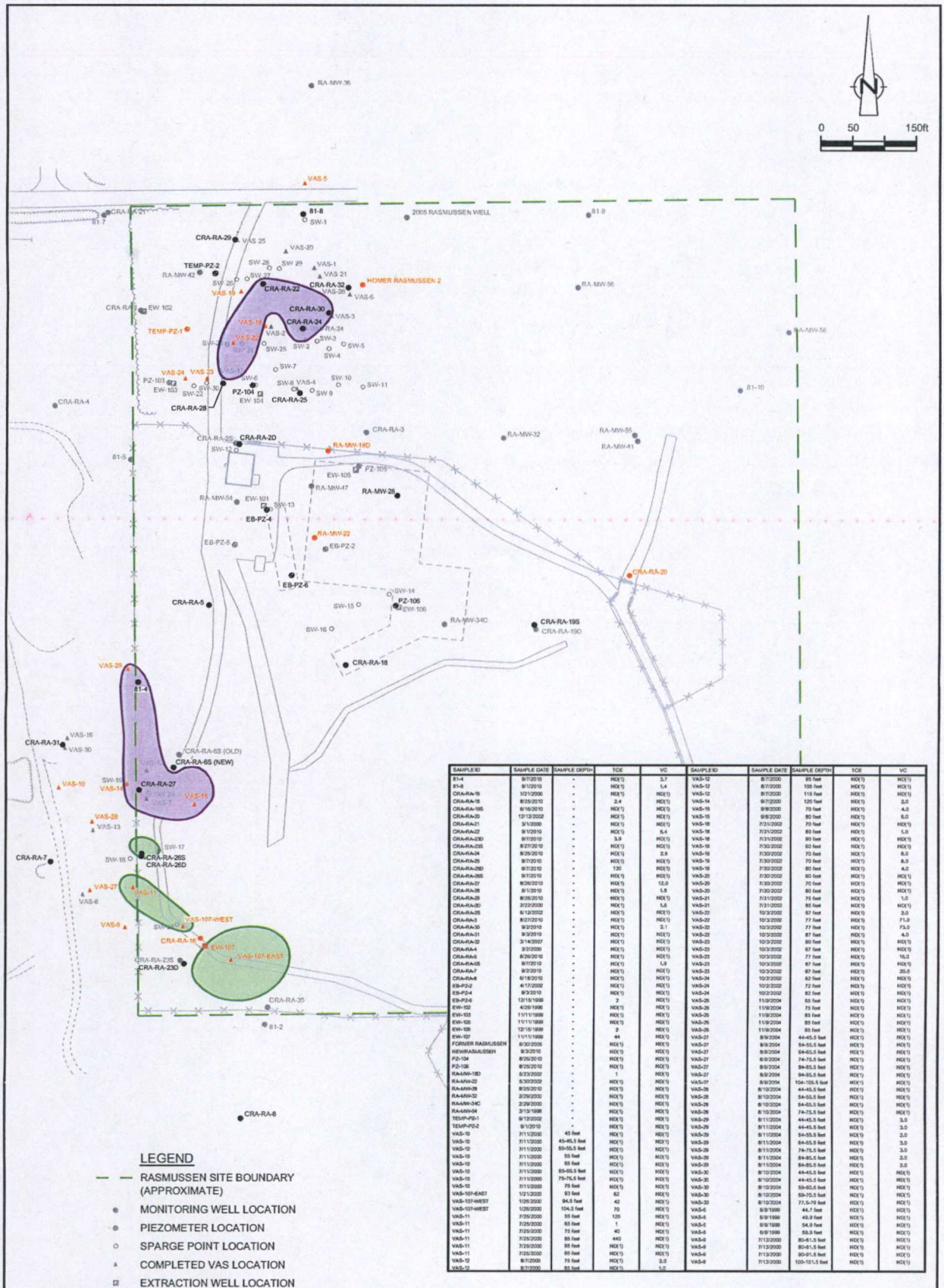
12/1/2014
Date



SAMPLE ID	SAMPLE DATE	SAMPLE DEPTH	TCE	VC	SAMPLE ID	SAMPLE DATE	SAMPLE DEPTH	TCE	VC
81-4	9/7/2010	-	ND(1)	3.7	VAS-12	8/7/2000	95 feet	ND(1)	ND(1)
81-8	9/1/2010	-	ND(1)	1.4	VAS-12	8/7/2000	105 feet	ND(1)	ND(1)
CRA-RA-1S	1/21/2000	-	ND(1)	ND(1)	VAS-12	8/7/2000	115 feet	ND(1)	ND(1)
CRA-RA-1S	8/25/2010	-	2.4	ND(1)	VAS-14	9/7/2000	120 feet	ND(1)	2.0
CRA-RA-19S	6/16/2010	-	ND(1)	ND(1)	VAS-15	9/8/2000	70 feet	ND(1)	4.0
CRA-RA-20	12/12/2002	-	ND(1)	ND(1)	VAS-15	9/8/2000	80 feet	ND(1)	6.0
CRA-RA-21	3/1/2000	-	ND(1)	ND(1)	VAS-18	7/31/2002	70 feet	ND(1)	ND(1)
CRA-RA-22	9/1/2010	-	ND(1)	5.4	VAS-18	7/31/2002	80 feet	ND(1)	1.0
CRA-RA-23D	9/7/2010	-	3.9	ND(1)	VAS-18	7/31/2002	90 feet	ND(1)	ND(1)
CRA-RA-23S	8/27/2010	-	ND(1)	ND(1)	VAS-19	7/30/2002	60 feet	ND(1)	ND(1)
CRA-RA-24	8/26/2010	-	ND(1)	2.9	VAS-19	7/30/2002	70 feet	ND(1)	8.0
CRA-RA-25	9/7/2010	-	ND(1)	ND(1)	VAS-19	7/30/2002	70 feet	ND(1)	8.0
CRA-RA-26D	9/7/2010	-	130	ND(1)	VAS-19	7/30/2002	80 feet	ND(1)	4.0
CRA-RA-26S	9/7/2010	-	ND(1)	ND(1)	VAS-20	7/30/2002	60 feet	ND(1)	ND(1)
CRA-RA-27	8/26/2010	-	ND(1)	12.0	VAS-20	7/30/2002	70 feet	ND(1)	ND(1)
CRA-RA-28	9/1/2010	-	ND(1)	1.8	VAS-20	7/30/2002	80 feet	ND(1)	ND(1)
CRA-RA-2D	8/26/2010	-	ND(1)	ND(1)	VAS-21	7/31/2002	75 feet	ND(1)	1.0
CRA-RA-2D	2/22/2000	-	ND(1)	1.6	VAS-21	7/31/2002	85 feet	ND(1)	ND(1)
CRA-RA-2S	6/12/2002	-	ND(1)	ND(1)	VAS-22	10/3/2002	67 feet	ND(1)	2.0
CRA-RA-3	8/27/2010	-	ND(1)	ND(1)	VAS-22	10/3/2002	77 feet	ND(1)	71.0
CRA-RA-30	9/2/2010	-	ND(1)	2.1	VAS-22	10/3/2002	77 feet	ND(1)	73.0
CRA-RA-31	9/3/2010	-	ND(1)	ND(1)	VAS-22	10/3/2002	87 feet	ND(1)	4.0
CRA-RA-32	3/14/2007	-	ND(1)	ND(1)	VAS-23	10/3/2002	80 feet	ND(1)	ND(1)
CRA-RA-4	3/2/2000	-	ND(1)	ND(1)	VAS-23	10/3/2002	87 feet	ND(1)	ND(1)
CRA-RA-5	8/26/2010	-	ND(1)	ND(1)	VAS-23	10/3/2002	77 feet	ND(1)	16.0
CRA-RA-6S	9/7/2010	-	ND(1)	1.8	VAS-23	10/3/2002	87 feet	ND(1)	ND(1)
CRA-RA-7	9/2/2010	-	ND(1)	ND(1)	VAS-23	10/3/2002	87 feet	ND(1)	20.0
CRA-RA-8	6/18/2010	-	ND(1)	ND(1)	VAS-24	10/2/2002	82 feet	ND(1)	ND(1)
EB-PZ-2	4/17/2002	-	ND(1)	ND(1)	VAS-24	10/2/2002	72 feet	ND(1)	ND(1)
EB-PZ-4	9/3/2010	-	ND(1)	ND(1)	VAS-24	10/2/2002	82 feet	ND(1)	ND(1)
EB-PZ-6	12/15/1999	-	2	ND(1)	VAS-25	11/9/2004	80 feet	ND(1)	ND(1)
EW-102	4/25/1995	-	ND(1)	ND(1)	VAS-26	11/9/2004	75 feet	ND(1)	ND(1)
EW-103	11/11/1999	-	ND(1)	ND(1)	VAS-26	11/9/2004	85 feet	ND(1)	ND(1)
EW-106	11/11/1999	-	ND(1)	ND(1)	VAS-26	11/9/2004	95 feet	ND(1)	ND(1)
EW-108	12/15/1999	-	2	ND(1)	VAS-26	11/9/2004	95 feet	ND(1)	ND(1)
EW-107	11/11/1999	-	44	ND(1)	VAS-27	8/9/2004	44-45.5 feet	ND(1)	ND(1)
FORMER RASMUSSEN	8/30/2005	-	ND(1)	ND(1)	VAS-27	8/9/2004	54-55.5 feet	ND(1)	ND(1)
NEWRASMUSSEN	9/3/2010	-	ND(1)	ND(1)	VAS-27	8/9/2004	64-65.5 feet	ND(1)	ND(1)
PZ-104	8/25/2010	-	ND(1)	ND(1)	VAS-27	8/9/2004	74-75.5 feet	ND(1)	ND(1)
PZ-106	8/25/2010	-	ND(1)	ND(1)	VAS-27	8/9/2004	84-85.5 feet	ND(1)	ND(1)
RA-MW-18D	5/23/2002	-	1	ND(1)	VAS-27	8/9/2004	94-95.5 feet	ND(1)	ND(1)
RA-MW-22	5/30/2002	-	ND(1)	ND(1)	VAS-27	8/9/2004	104-105.5 feet	ND(1)	ND(1)
RA-MW-28	8/25/2010	-	ND(1)	ND(1)	VAS-28	8/10/2004	44-45.5 feet	ND(1)	ND(1)
RA-MW-32	3/29/2000	-	ND(1)	ND(1)	VAS-28	8/10/2004	54-55.5 feet	ND(1)	ND(1)
RA-MW-34C	2/29/2000	-	ND(1)	ND(1)	VAS-28	8/10/2004	64-65.5 feet	ND(1)	ND(1)
RA-MW-54	3/13/1998	-	ND(1)	ND(1)	VAS-28	8/10/2004	74-75.5 feet	ND(1)	ND(1)
TEMP-PZ-1	9/13/2002	-	ND(1)	ND(1)	VAS-29	8/11/2004	44-45.5 feet	ND(1)	3.0
TEMP-PZ-2	9/1/2010	-	ND(1)	ND(1)	VAS-29	8/11/2004	44-45.5 feet	ND(1)	3.0
VAS-10	7/11/2000	45 feet	ND(1)	ND(1)	VAS-29	8/11/2004	54-55.5 feet	ND(1)	2.0
VAS-10	7/11/2000	45-45.5 feet	ND(1)	ND(1)	VAS-29	8/11/2004	64-65.5 feet	ND(1)	3.0
VAS-10	7/11/2000	55-55.5 feet	ND(1)	ND(1)	VAS-29	8/11/2004	74-75.5 feet	ND(1)	3.0
VAS-10	7/11/2000	55 feet	ND(1)	ND(1)	VAS-29	8/11/2004	84-85.5 feet	ND(1)	2.0
VAS-10	7/11/2000	65 feet	ND(1)	ND(1)	VAS-29	8/11/2004	84-85.5 feet	ND(1)	2.0
VAS-10	7/11/2000	65-65.5 feet	ND(1)	ND(1)	VAS-30	8/10/2004	44-45.5 feet	ND(1)	ND(1)
VAS-10	7/11/2000	75-75.5 feet	ND(1)	ND(1)	VAS-30	8/10/2004	44-45.5 feet	ND(1)	ND(1)
VAS-10	7/11/2000	75 feet	ND(1)	ND(1)	VAS-30	8/10/2004	59-60.5 feet	ND(1)	ND(1)
VAS-107-EAST	1/21/2000	83 feet	62	ND(1)	VAS-30	8/10/2004	69-70.5 feet	ND(1)	ND(1)
VAS-107-WEST	1/25/2000	94.5 feet	42	ND(1)	VAS-30	8/10/2004	77.5-79 feet	ND(1)	ND(1)
VAS-107-WEST	1/25/2000	104.5 feet	70	ND(1)	VAS-5	5/9/1999	44.7 feet	ND(1)	ND(1)
VAS-11	7/25/2000	55 feet	120	ND(1)	VAS-5	5/9/1999	49.9 feet	ND(1)	ND(1)
VAS-11	7/25/2000	65 feet	1	ND(1)	VAS-5	5/9/1999	54.9 feet	ND(1)	ND(1)
VAS-11	7/25/2000	75 feet	40	ND(1)	VAS-5	5/9/1999	59.9 feet	ND(1)	ND(1)
VAS-11	7/25/2000	85 feet	440	ND(1)	VAS-9	7/13/2000	80-81.5 feet	ND(1)	ND(1)
VAS-11	7/25/2000	95 feet	ND(1)	ND(1)	VAS-9	7/13/2000	80-81.5 feet	ND(1)	ND(1)
VAS-11	7/25/2000	95 feet	ND(1)	ND(1)	VAS-9	7/13/2000	90-91.5 feet	ND(1)	ND(1)
VAS-12	8/7/2000	75 feet	ND(1)	2.0	VAS-9	7/13/2000	100-101.5 feet	ND(1)	ND(1)
VAS-12	8/7/2000	85 feet	ND(1)	1.0					

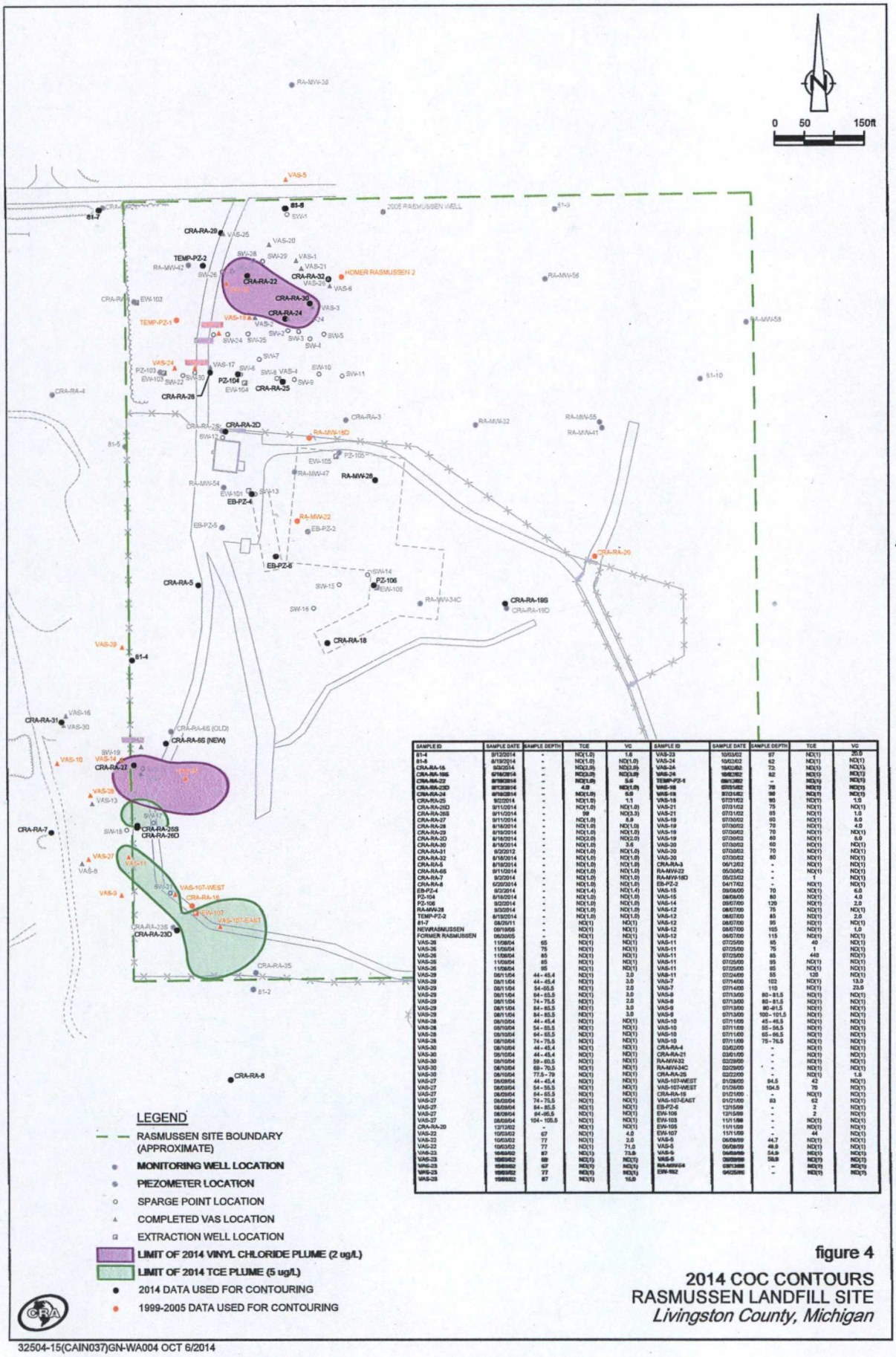
LEGEND

- RASMUSSEN SITE BOUNDARY (APPROXIMATE)
- MONITORING WELL LOCATION
- PIEZOMETER LOCATION
- SPARGE POINT LOCATION
- COMPLETED VAS LOCATION
- EXTRACTION WELL LOCATION
- LIMIT OF 2010 VINYL CHLORIDE PLUME (2 ug/L)
- LIMIT OF 2010 TCE PLUME (5 ug/L)
- 2010 DATA USED FOR CONTOURING
- 1999-2005 DATA USED FOR CONTOURING

figure 4

2010 COC CONTOURS
RASMUSSEN LANDFILL SITE
Livingston County, Michigan

32504-15(CAIN018)GN-WA002 OCT 08/2010



SAMPLE ID	SAMPLE DATE	SAMPLE DEPTH	TCE	VC
81-4	9/12/2014	-	ND(1.0)	1.6
81-8	8/19/2014	-	ND(1.0)	ND(1.0)
CRA-RA-15	9/3/2014	-	ND(2.9)	ND(2.9)
CRA-RA-19S	8/18/2014	-	ND(3.0)	ND(3.0)
CRA-RA-22	8/18/2014	-	ND(1.0)	5.6
CRA-RA-23D	8/13/2014	-	4.8	ND(1.0)
CRA-RA-24	8/18/2014	-	ND(1.0)	6.0
CRA-RA-25	9/2/2014	-	ND(1.0)	1.1
CRA-RA-26D	9/11/2014	-	ND(1.0)	ND(1.0)
CRA-RA-26S	9/11/2014	-	59	ND(3.3)
CRA-RA-27	9/11/2014	-	ND(1.0)	8.9
CRA-RA-28	8/18/2014	-	ND(1.0)	ND(1.0)
CRA-RA-29	8/19/2014	-	ND(1.0)	ND(1.0)
CRA-RA-2D	8/18/2014	-	ND(2.0)	ND(2.0)
CRA-RA-30	8/18/2014	-	ND(1.0)	3.6
CRA-RA-31	9/2/2012	-	ND(1.0)	ND(1.0)
CRA-RA-32	8/18/2014	-	ND(1.0)	ND(1.0)
CRA-RA-5	8/18/2014	-	ND(1.0)	ND(1.0)
CRA-RA-6S	9/11/2014	-	ND(1.0)	ND(1.0)
CRA-RA-7	9/2/2014	-	ND(1.0)	ND(1.0)
CRA-RA-8	5/20/2014	-	ND(1.0)	ND(1.0)
EB-PZ-4	9/3/2014	-	ND(1.4)	ND(1.4)
PZ-104	8/18/2014	-	ND(1.0)	ND(1.0)
PZ-106	9/2/2014	-	ND(1.0)	ND(1.0)
RA-MW-28	9/3/2014	-	ND(1.0)	ND(1.0)
TEMP-PZ-2	8/18/2014	-	ND(1.0)	ND(1.0)
81-7	08/25/11	-	ND(1)	ND(1)
NEVRA/RASMUSSEN	09/19/05	-	ND(1)	ND(1)
FORMER RASMUSSEN	05/30/05	-	ND(1)	ND(1)
VAS-26	11/08/04	65	ND(1)	ND(1)
VAS-26	11/08/04	75	ND(1)	ND(1)
VAS-26	11/08/04	85	ND(1)	ND(1)
VAS-26	11/09/04	85	ND(1)	ND(1)
VAS-26	11/08/04	95	ND(1)	ND(1)
VAS-29	08/11/04	44 - 45.4	ND(1)	2.0
VAS-29	08/11/04	44 - 45.4	ND(1)	3.0
VAS-29	08/11/04	54 -55.5	ND(1)	2.0
VAS-29	08/11/04	54 - 55.5	ND(1)	3.0
VAS-29	08/11/04	74 - 75.5	ND(1)	2.0
VAS-29	08/11/04	84 - 85.5	ND(1)	3.0
VAS-29	08/11/04	84 - 85.5	ND(1)	3.0
VAS-28	08/10/04	44 - 45.4	ND(1)	ND(1)
VAS-28	08/10/04	54 - 55.5	ND(1)	ND(1)
VAS-28	08/10/04	64 - 65.5	ND(1)	ND(1)
VAS-28	08/10/04	74 - 75.5	ND(1)	ND(1)
VAS-30	08/10/04	44 - 45.4	ND(1)	ND(1)
VAS-30	08/10/04	44 - 45.4	ND(1)	ND(1)
VAS-30	08/10/04	59 - 60.5	ND(1)	ND(1)
VAS-30	08/10/04	69 - 70.5	ND(1)	ND(1)
VAS-30	08/10/04	77.5 - 79	ND(1)	ND(1)
VAS-27	08/09/04	44 - 45.4	ND(1)	ND(1)
VAS-27	08/09/04	54 - 55.5	ND(1)	ND(1)
VAS-27	08/09/04	64 - 65.5	ND(1)	ND(1)
VAS-27	08/09/04	74 - 75.5	ND(1)	ND(1)
VAS-27	08/09/04	84 - 85.5	ND(1)	ND(1)
VAS-27	08/09/04	94 - 95.5	ND(1)	ND(1)
VAS-27	08/09/04	104 - 105.5	ND(1)	ND(1)
CRA-RA-20	12/12/02	-	ND(1)	ND(1)
VAS-22	10/03/02	67	ND(1)	4.0
VAS-22	10/03/02	77	ND(1)	2.0
VAS-22	10/03/02	77	ND(1)	71.0
VAS-23	10/03/02	67	ND(1)	73.0
VAS-23	10/03/02	69	ND(1)	ND(1)
VAS-23	10/03/02	67	ND(1)	ND(1)
VAS-23	10/03/02	77	ND(1)	ND(1)
VAS-29	10/03/02	67	ND(1)	16.0

SAMPLE ID	SAMPLE DATE	SAMPLE DEPTH	TCE	VC
VAS-23	10/03/02	97	ND(1)	20.0
VAS-24	10/02/02	62	ND(1)	ND(1)
VAS-24	10/02/02	72	ND(1)	ND(1)
VAS-24	10/02/02	82	ND(1)	ND(1)
TEMP-PZ-1	09/12/02	-	ND(1)	ND(1)
VAS-18	07/31/02	78	ND(1)	ND(1)
VAS-18	07/31/02	88	ND(1)	ND(1)
VAS-18	07/31/02	98	ND(1)	ND(1)
VAS-21	07/31/02	75	ND(1)	ND(1)
VAS-21	07/31/02	85	ND(1)	1.0
VAS-19	07/30/02	60	ND(1)	8.0
VAS-19	07/30/02	70	ND(1)	4.0
VAS-19	07/30/02	70	ND(1)	ND(1)
VAS-19	07/30/02	80	ND(1)	8.0
VAS-20	07/30/02	60	ND(1)	ND(1)
VAS-20	07/30/02	70	ND(1)	ND(1)
VAS-20	07/30/02	80	ND(1)	ND(1)
CRA-RA-3	06/12/02	-	ND(1)	ND(1)
RA-MW-22	05/30/02	-	ND(1)	ND(1)
RA-MW-18D	05/23/02	-	1	ND(1)
EB-PZ-2	04/17/02	-	ND(1)	ND(1)
VAS-15	09/06/00	70	ND(1)	6.0
VAS-15	09/06/00	80	ND(1)	4.0
VAS-14	08/07/00	120	ND(1)	2.0
VAS-12	08/07/00	75	ND(1)	ND(1)
VAS-12	08/07/00	85	ND(1)	2.0
VAS-12	08/07/00	95	ND(1)	ND(1)
VAS-12	08/07/00	105	ND(1)	1.0
VAS-12	08/07/00	115	ND(1)	ND(1)
VAS-11	07/25/00	95	40	ND(1)
VAS-11	07/25/00	75	1	ND(1)
VAS-11	07/25/00	85	440	ND(1)
VAS-11	07/25/00	95	ND(1)	ND(1)
VAS-11	07/25/00	85	ND(1)	ND(1)
VAS-11	07/24/00	55	120	ND(1)
VAS-7	07/14/00	102	ND(1)	13.0
VAS-7	07/14/00	110	ND(1)	23.0
VAS-9	07/13/00	80 - 81.5	ND(1)	ND(1)
VAS-9	07/13/00	80 - 81.5	ND(1)	ND(1)
VAS-9	07/13/00	90 -91.5	ND(1)	ND(1)
VAS-9	07/13/00	100 - 101.5	ND(1)	ND(1)
VAS-10	07/11/00	45 - 46.5	ND(1)	ND(1)
VAS-10	07/11/00	55 - 56.5	ND(1)	ND(1)
VAS-10	07/11/00	65 - 66.5	ND(1)	ND(1)
VAS-10	07/11/00	75 - 76.5	ND(1)	ND(1)
CRA-RA-4	03/02/00	-	ND(1)	ND(1)
CRA-RA-21	03/01/00	-	ND(1)	ND(1)
RA-MW-32	02/29/00	-	ND(1)	ND(1)
RA-MW-34C	02/29/00	-	ND(1)	ND(1)
CRA-RA-2S	02/23/00	-	ND(1)	1.0
VAS-107-WEST	01/26/00	94.5	42	ND(1)
VAS-107-WEST	01/26/00	104.5	70	ND(1)
CRA-RA-1S	01/21/00	-	ND(1)	ND(1)
VAS-107-EAST	01/21/00	83	62	ND(1)
EB-PZ-6	12/15/99	-	2	ND(1)
EW-106	12/15/99	-	2	ND(1)
EW-103	11/1/99	-	ND(1)	ND(1)
EW-105	11/1/99	-	ND(1)	ND(1)
EW-107	11/1/99	-	41	ND(1)
VAS-5	06/09/99	44.7	ND(1)	ND(1)
VAS-5	06/09/99	49.9	ND(1)	ND(1)
VAS-5	06/09/99	54.9	ND(1)	ND(1)
VAS-5	06/09/99	59.9	ND(1)	ND(1)
RA-MW-24	03/13/96	-	ND(1)	ND(1)
EW-102	04/25/96	-	ND(1)	ND(1)

figure 4

2014 COC CONTOURS
RASMUSSEN LANDFILL SITE
Livingston County, Michigan

32504-15(CAIN037)GN-WA004 OCT 6/2014